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US Army Corps
of Engineers
Louisville District

SUPERFUND FIVE YEAR REVIEW REPORT

LEE'S LANE LANDFILL

LOUISVILLE, JEFFERSON COUNTY, KY

EPA ID: KYD980557052

PREPARED FOR
U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION IV

JUNE 2003

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THE U.S. ENVIRONMENTAL PROTECTION AGENCY, REGION IV
ATLANTA, GA

PREPARED BY:
US Army Corps of Engineers
Louisville District
CELRL-ED-E

June 2003

Five-Year Review Report

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List of Acronyms

ACL	Alternate Concentration Limit
ARAR	Applicable or Relevant and Appropriate Requirement
ATSDR	Agency for Toxic Substances and Disease Registry
ATV	All-Terrain Vehicle
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFS	Cubic feet per second
EDD	Enforcement Decision Document
EPA	United States Environmental Protection Agency
CFR	Code of Federal Regulations
HRS	Hazard Ranking System
HTRW	Hazardous, Toxic, Radiological Waste
KNREPC	Kentucky Natural Resources and Environmental Protection Cabinet
LEL	Lower Explosive Limit
MCL	Maximum Contaminant Level
MSD	Metropolitan Sewer District
NCP	National Contingency Plan
NPL	National Priorities List
O&M	Operation and Maintenance
RA	Remedial Action
RAO	Remedial Action Objective
RD	Remedial Design
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
SAD	Surveillance and Analysis Division of the Kentucky Division of Waste Management
SDWA	Safe Drinking Water Act
SMCL	Secondary Maximum Contaminant Level
UST	Underground Storage Tank

Executive Summary

The remedy for the Lee's Lane Landfill in Louisville, KY included operation and maintenance of a subsurface gas collection system, provision for alternate water supplies, removal of exposed drums, capping soils in hot spot areas, imposition of site security measures, and monitoring of groundwater, gas, and air. The site achieved construction completion on March 18, 1988. Operation and maintenance activities at the site were transferred to the Louisville Metropolitan Sewer District (MSD) in 1991. The trigger for this third five-year review was the completion of the second five-year report, dated June 30, 1998.

The assessment conducted for this five-year review found that the remedy was constructed and has been operated and maintained in accordance with the requirements of the Enforcement Decision Document (EDD). The remedy has functioned as designed.

The remedy at the Lee's Lane Landfill currently protects human health and the environment, because it significantly reduces the migration of explosive gases from the landfill and minimizes on-site and off-site exposure to contamination. To insure that the remedy will be protective in the long-term, a complete re-evaluation of the subsurface gas collection system is needed. Although many practical site security measures have been taken, the limits and liabilities of current measures need to be re-evaluated in terms of pedestrian traffic resulting from the recently constructed walking path adjacent to the landfill and uncontrolled trespasser quad-runner ATV traffic within the landfill itself.

The main recommendation in this report is that the principal component of the remediation, operation of the subsurface gas collection system, be evaluated immediately to ensure continued effectiveness. The system should be overhauled if necessary and monitored. Results of the evaluation and monitoring should be reported in the next five-year review which will be due by June 30, 2008.

Five-Year Review Summary Form

SITE IDENTIFICATION		
Site name *(from WasteLAN)*: **Lee's Lane Landfill**		
EPA ID *(from WasteLAN)*: **KYD980557052**		
Region: 04	**State: KY**	**City/County: Louisville / Jefferson**
SITE STATUS		
NPL status: Deleted **04/25/96**		
Remediation status : Complete		
Multiple OUs?* NO	**Construction completion date: 03/18/1988**	
Has site been put into reuse? NO		
REVIEW STATUS		
Lead agency: US EPA, Region 4		
Author name: John Jent		
Author title: Project Engineer	**Author affiliation: US Corps of Engineers**	
Review period:** 12 /15 /2002 to 03 /30 /2003		
Date(s) of site inspection: 02/ 25/2003		
Type of review: Statutory		
Review number: 3		
Triggering action: Previous Five-Year Review Report Date		
Triggering action date *(from WasteLAN)*: 06 / 30 / 1998		
Due date *(five years after triggering action date)*: 06 / 30 / 2003		

* ["OU" refers to operable unit.]
** [Review period should correspond to the actual start and end dates of the Five-Year Review in WasteLAN.]

Five-Year Review Summary Form, cont'd

Issues:

Increasing concentrations of methane gas levels, in both the gas monitoring wells and ambient air sampling, indicate a very strong need for an extensive evaluation of the subsurface gas collection system. As part of this review, conditions at the site were discussed with Mr. James J. Walsh of SCS Engineers. SCS Engineers initially designed the subsurface gas collection system and later repaired it. Based on the discussion, it was the recommendation of SCS Engineers that the subsurface gas collection system be thoroughly evaluated as soon as possible.

Although MSD has taken many feasible measures to provide site security, the placement of pedestrian path along the levee top and the large amount of uncontrolled trespasser quad-runner ATV traffic require that MSD, the City of Louisville, and the EPA further consider the limits and ramifications of site security measures.

MSD operation and maintenance have been hampered by not having at its disposal the basic project documentation. Additionally, such information should have been available at a nearby public repository.

Since all residents adjacent to the project are now connected to a municipal water supply, there is no need to continue monitoring Groundwater Wells MWs-A, B, and 02 since there is no longer a complete pathway for groundwater exposure.

New Kentucky Water Quality Standards require additional laboratory analyses for the groundwater samples from Groundwater MWs-04,05.

Recommendations and Follow-up Actions:

1 Maintain already programmed (O&M) activities by the MSD and increase the level of oversight by the Kentucky Natural Resources and Environmental Protection Cabinet.
2 Obtain basic documentation, design, and O&M information for the subsurface gas collection system from the firm that designed it.
3 Conduct a comprehensive evaluation of the subsurface gas collection system using a qualified firm.
4 Re-evaluate site security measures, limits, and liabilities in view of pedestrian and uncontrolled trespasser quad-runner ATV traffic.

5 Improve site drainage to minimize ponding of surface water.
6 Insure more timely evaluation of the results of site monitoring information to recognize significant trends and to determine if measured parameters exceed regulatory limits.
7 Re-establish a repository for project related information, especially operations and maintenance manuals and as-built drawings.
8 Develop a plan coordinated with the MSD, the City of Louisville, and the EPA that addresses the current issues.
9 Present to the public the plan developed to resolve the current issues.
10 Discontinue monitoring of groundwater wells, MWs-A,B,02.
11 Add laboratory analyses for beryllium, hexavalent chromium(discontinue total chromium),copper and filtered lead for samples from groundwater monitoring wells, MW-04 and 05.

Protectiveness Statement:

The remedy at the Lee's Lane Landfill currently protects human health and the environment, because it significantly reduces the migration of explosive gases from the landfill and minimizes on-site and off-site exposure to contamination. In order to insure that the subsurface gas collection system continues to function at its current level or better, a re-evaluation of the system will be initiated by December 2003. Although many practical site security measures have been taken, the limits and liabilities of current measures need to be re-evaluated in terms of pedestrian traffic resulting from the recently constructed walking path adjacent to the landfill and uncontrolled trespasser quad-runner ATV traffic within the landfill itself.

Winston A. Smith

9-2-07

Winston A. Smith, Director
Waste Management Division
US EPA, Region 4

Date

Five-Year Review Report

1. Introduction

The Purpose of the Review

The purpose of five-year reviews is to determine whether the remedy at a site is protective of human health and the environment. The methods, findings, and conclusions of reviews are documented in Five-Year Review reports. In addition, Five-Year Review reports identify issues found during the review, and make recommendations to address them.

Authority for Conducting the Five-Year Review

The Agency is preparing this five-year review pursuant to CERCLA §121 and the National Contingency Plan (NCP). CERCLA §121 states:

> *If the President selects a remedial action that results in any hazardous substances, pollutants, or contaminants remaining at the site, the President shall review such remedial action no less often than each five years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented. In addition, if upon such review it is the judgment of the President that action is appropriate at such site in accordance with section [104] or [106], the President shall take or require such action. The President shall report to the Congress a list of facilities for which such review is required, the results of all such reviews, and any actions taken as a result of such reviews.*

The agency interpreted this requirement further in the National Contingency Plan (NCP); 40 CFR §300.430(f)(4)(ii) states:

> *If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such action no less often than every five years after the initiation of the selected remedial action.*

Who Conducted the Five-Year Review

Personnel of the U.S. Army Corps of Engineers, John Jent, Nathaniel Peters, and Al Scalzo of the Louisville District, conducted this five-year review of the remedial actions implemented at the Lee's Lane Landfill in Louisville, KY. The review was conducted from December 2002 through March 2003. This report documents the results of the review. Support of the US Army Corps of Engineers for this review was provided for under EPA Work Authorization Form of Interagency Agreement (IAP) No. DW96945884.

Additionally, Mr. Richard Watkins of the Louisville Metropolitan Sewer District, who performs Operation and Maintenance (O & M) on the site, provided much support for this review. Mr. Ken Logsdon of the Kentucky Division of Waste Management, who oversees O & M activities, provided assistance during the inspection. Finally, Mr. Femi Akindele from Region IV of the U.S.EPA arranged for, and participated in the inspection. A full list of site inspection participants is provided in Attachment C-1.

Other Review Characteristics

This is the third Five-Year review for the Lee's Lane Landfill. The triggering action for this review is the final report of the Second Five-Year Review dated 06/30/98, as shown in EPA's WasteLAN database. Since the landfill waste was, for the most part, left in place, the selected remedy requires continual operation of a subsurface gas collection and venting system to prevent migration of landfill-generated gases into an adjacent residential area. Additionally, ground water wells, gas wells, ambient air, settlement plates, and surface conditions are monitored to determine the adequacy of the site's remedial measures. Therefore, a review is required to be conducted at least every five years.

II. Site Chronology

Table 1: Chronology of Site Events

Event	Date
Flash fires around residential water heaters due to migration of methane gas from the landfill	Early 1975
Gas subsurface venting system installed by KY Dept of Hazardous Materials and Waste Management	10/1980
Listed on NPL	09/08/1983
Remedial Investigation/Feasibility Study complete	04/1986
Enforcement Decision Document (EDD)	09/1986
EPA completed response actions according to EDD	03/18/1988
O&M transferred from EPA to MSD	07/16/1991
1st Five-year review report	03/11/1993
Site Review and Update by ATSDR	09/30/1993
Oversight of MSD's O&M transferred to KNREPC	04/07/1994
Delisted from NPL	04/25/1996
2nd five-year review report	06/30/1998

III. Background

Physical Characteristics

The Lee's Lane Landfill site is located in the City of Louisville, Jefferson County, Kentucky and is 112 acres in size. The site is located on the southeast bank of the Ohio River from approximate river mile 615.35 to 616.2 and lies between the river and the Louisville Levee. The site location is shown on Figure 1, and a recent aerial view of the landfill is provided as Figure 7. The entire site is approximately 5,000 feet long and 1,500 feet wide. As indicated on Figures 2 and 3, the landfill is divided into three portions, a northern tract, central tract, and southern tract. The Northern and Central Tracts of the landfill consist of level to gently sloping land, while the Southern Tract contains two depressions with steep slopes. Much of the landfill surface is covered with well-established vegetation ranging from brush to woodlands. Elevations range from 383 feet above mean sea level along the Ohio River to 461 feet at the top of the levee. The geology of the site consists of approximately 110 feet of Ohio River alluvium (20 - 30 feet of silts and clay over 80-90 feet of sand with varying amounts of gravel), see Figure 6. Underlying the river alluvium is the New Albany Shale. The alluvial aquifer is unconfined with the shale forming an aquitard between the alluvial aquifer and the deep limestone aquifers. The water table is approximately 50 feet below the surface. Flow in the aquifer is predominantly toward the Ohio River. During periods of high river flow, however, groundwater flow direction may reverse. Water levels in the aquifer vary with fluctuations of the Ohio River.

Land and Resource Use

The landfill is bounded on the northeast by the Borden, Inc. chemical plant; on the southeast by the Louisville Flood Protection Levee and thence the residential area of Riverside Gardens, which contains about 330 homes; on the southwest by the Louisville Gas and Electric Company Mill Creek Pump Plant; and along the northwest boundary by the Ohio River.

Prior to 1993, there were a small number of private drinking water wells located in the Riverside Garden subdivision. However, since at least 1993, the entire subdivision has been supplied public water by the Louisville Water Company.

Although most of the natural plant communities at the site have been disturbed, a good secondary growth of grasses and shrubs have developed over the Northern and Central Tracts, while a low-lying area in the Southern Tract has developed into a wetland and open water area. Additionally, a dense growth of vegetation characteristic of riparian woods exists along the Ohio River. The diversity of habitats at the site suggests the area could contain an abundant faunal population. Small mammals are expected to dominate the woodland and brush areas. These areas would also be conducive to birdlife. Aquatic life in the Ohio River near the site is dominated by pollution-tolerant species.

History of Contamination

Domestic, commercial, and industrial wastes were disposed of in the landfill from the late 1940's to 1975. Prior to and during its use as a landfill, sand and gravel were quarried at the site. In 1971, the State of KY permitted the Southern Tract of the landfill under its Solid Waste Program. In 1974, the Lee's Lane Landfill permit expired and, due to repeated compliance violations, was not renewed.

In March 1975, the Jefferson County Department of Public Health was notified of the presence of methane gas in the Riverside Gardens subdivision. As a result of explosive levels of methane gas, seven families along the street closest to the landfill were evacuated by the Jefferson County Housing Authority. In April 1975, the KY Natural Resources and Environmental Protection Cabinet filed a lawsuit against the landfill owners. This resulted in the closure of the landfill in the same year.

Initial Response

Between 1975 and 1979, 44 gas observation wells were installed in and around the landfill and in Riverside Gardens to monitor the concentration, pressure and lateral extent of methane gas migration. Samples collected from these wells indicted that the source of the methane and associated toxic gases was the decomposition of landfill wastes. In October 1980, a gas collection system was designed and installed on the site by SCS Engineers, between the landfill and Riverside Gardens.

In November 1978, the Surveillance and Analysis Division(SAD) of the Kentucky Division of Waste Management collected samples from residential wells in Riverside Gardens to determine the potential effects of the landfill on groundwater quality. As a result of the study, the SAD reported that there was no indication of the migration of contaminated groundwater from the landfill to the residential wells.

In February 1980, the KY Department of Hazardous Materials and Waste Management discovered approximately 400 drums about 100 feet from the Ohio River bank on a 10-foot vertical rise above the river. In September and October of 1981, the drums were removed by the landfill owners under Court Order. The wastes were removed from the drums and transported to an approved hazardous waste disposal facility. The remaining non-hazardous drummed materials and empty drums were buried onsite.

In early 1981, the Kentucky Natural Resources and Environmental Protection Cabinet (KNREPC) installed eleven shallow groundwater monitoring wells at the site. Five of these were later sampled by EPA. Analyses of the samples indicated that the on-site groundwater contained inorganic compounds at elevated concentrations. However the results were believed to be affected by the presence of sediment in the wells, apparently due to improper well completion.

Basis for Taking Action

In December 1982, the EPA evaluated the Lee's Lane Landfill Site using the Hazard Ranking System (HRS) as described in the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). The overall score was 47.46 which ranked the site high enough to be placed on the National Priorities List (NPL). The site received a high score because of its distance from the nearest population (300 feet), the floodway location, the identification of landfill hazardous wastes, particularly chromium and vinyl chloride, and the close proximity to the nearest well in Riverside Gardens.

The Remedial Investigation/Feasibility Study (RI/FS) completed in April 1986 concluded as follows:

- The onsite migration pathways consisted of surface water infiltration to groundwater in the Northern and Central Tracts, with minimum runoff and ponding except during major storms and floods. Surface water infiltration was also expected in the Southern Tract, but runoff to the large pond was a probable pathway due to the steep slopes.

- Onsite surface water contained very low levels of contaminants. Onsite soils and sediments were similar to the offsite background sample collected in Riverside Gardens, suggesting the use of local soils as cover material. In two areas where "hot spot" soil samples were collected, the estimated concentrations of lead and chromium were 2,000 mg/kg each. These areas were located along the access road in the Central Tract and were believed to be the result of indiscriminate dumping since the concentrations found were not representative of overall soil concentrations.

- The major migration pathway for groundwater was direct discharge to the Ohio River. The groundwater discharge from the landfill to the Ohio River was estimated at 0.0015 % of the total Ohio River flow. If high water conditions on the Ohio River were to exist for a sufficient period of time, groundwater reversal might occur and flow would be toward the Riverside Gardens residential wells. Additionally, the effects of contaminant migration under the Ohio River were expected to be inconsequential.

- Onsite groundwater contained low levels of organic compounds and some inorganic contaminants. The major inorganic compounds included arsenic, barium, cadmium, chromium, lead, manganese, and iron. The offsite concentrations of these contaminants were below the maximum contaminant levels (MCL) set in the Interim Primary Drinking Water Regulations. Neither manganese nor iron was considered to pose significant health risks.

- The IT Corporation evaluated the existing subsurface gas collection system and concluded that the system was operating at less than 50% efficiency. Gas monitoring indicated, however, that it was still mitigating gas migration. In November 1985, the Jefferson County Department of Public Works contracted SCS Engineers to inspect the gas collection system. Repairs of problem areas noted were completed in 1986.

- The public health assessment concluded that the primary health concern at the site was the elevated chromium levels found in onsite groundwater. Need for groundwater remediation was not indicated by the public health assessment. However, long-term monitoring of groundwater and ambient air was recommended to establish baseline conditions and to serve as an early detection system should site conditions change.

- There was no evidence of an offsite public health or environmental problem related to the site based on available information.

- The public health assessment indicated that the existing gas collection system was mitigating gas migration, but that the system needed to be repaired or replaced. A routine subsurface gas monitoring program also needed to be implemented outside the collection system and in Riverside Gardens.

- The public health assessment also noted that, in the absence of controlled access to the site, the surface wastes should be removed and the soils containing elevated levels of chromium and lead should be covered.

IV. Remedial Actions

Enforcement Decision Document (EDD)

The EPA signed an Enforcement Decision Document (EDD) on September 25, 1986, for the Lee's Lane Landfill. The document provided for the following response actions:

1 Inspection, repair, and operation of the gas collection system,
2 Provision for alternate water supplies for residences still on wells,
3 Removal of exposed drums,
4 Capping with soils in "hot spots" in an area of exposed trash and disposal of exposed wastes
5 Imposition of institutional controls, including security gates and cautionary signs,
6 Construction of a rip-rap slope along the Ohio River bank,
7 Repair of an existing drainage ditch and installation of a 20-inch drainage pipe,
8 Monitoring of groundwater wells, gas wells , and ambient air, and
9 Operation and maintenance activities to include inspection of the gas monitoring wells, the gas collection system, capped waste areas and the riprap along the Ohio River bank.

Remedy Implementation

On March 10, 1987, the EPA initiated a removal action in accordance with the EDD, as described above. The removal action was completed on March 18, 1988.

System Operation/Operation and Maintenance (O & M)

The EPA performed operation and maintenance from July 1988 to June 1989. On July 16, 1991, the EPA issued an Administrative Order of Consent under which the Louisville and Jefferson County

Metropolitan Sewer District (MSD), agreed to perform certain O&M activities at the site for twenty-nine (29) years. On April 7, 1994, the Commonwealth of Kentucky entered into an Intergovernmental Response Agreement with the EPA under which Kentucky assumed responsibility for the oversight of MSD's O&M activities.

MSD performs many of its required O&M activities by its own in-house staff and does not track the costs of the efforts. However, subcontractor costs for monitoring survey monuments, groundwater sampling and analyses, and gas monitoring are approximately $18,000 per year.

V. Progress Since the Last Review

The second Five-Year Review report for the Lee's Lane remedial action was signed on June 30, 1998. The report concluded that the response action by EPA remained protective of human health and the environment, but that the gas collection system required maintenance. The recommended actions and accomplishments are as follows:

The gas collection system should be checked for proper operation and serviced as necessary. To date, this has not been accomplished.

Install better security measures, including barricades to deter site access. The lock at the Lee's Lane has been restored and the gates maintained, however, there still exists much four-wheel driver trespassing.

Fill low areas along the access road. Some areas have been filled with gravel.

Mow grass on a regular basis. Grass is mowed five times a year when performing similar mowing along the adjacent flood control levee.

Establish and maintain a proper ground survey to monitor ground movements within the area of riprap along the Ohio River bank. A survey of the subject monuments has been completed recently and another is scheduled for 2004.

Remove and properly dispose of an on-site 20,000 gallon underground storage tank (UST). This has been done.

Continue air and gas well sampling on a quarterly basis and groundwater monitoring on an annual basis. Although several of these monitoring events were not performed, such monitoring has been conducted for 2000, 2001, and 2002.

Continue quarterly site inspections. These are done regularly.

VI. Five-Year Review Process

Administrative Components

In November 2002, Mr. Femi Akindele of the EPA requested the assistance of the U.S. Army Corps of Engineers in performing the third Five-Year review of the subject project. Hard copies of the major project documents could not be located either with MSD or at the Site Repository indicted on EPA websites. Subsequently, Mr. Akindele provided copies, via compact disc, of most of the project documents to the Corps in early-December 2002. In mid-December 2002, Messrs Nathaniel Peters and John Jent met with Mr. Richard Watkins at the MSD facility to discuss available documentation and to receive a brief overview of the site. Some additional documentation, mostly maps, were provided by Mr. Watkins at that time. In January, the Corps asked for and received documentation of historic sampling and analysis results from KNREPC, which MSD currently did not have. In mid-January 2003, representatives of the EPA, the Army Corps of Engineers, MSD, and the KNREPC established the following schedule:

Document Review	Mid Jan - Mid Feb
Data Review	Mid Jan - Mid Feb
Site Inspection	February 25, 2003
Telephone Interviews	March 2003
Five-Year Draft Report	April 4, 2003
Five-Year Final Report	May 9, 2003.

Document Review

This five-year review consisted of a review of the RI, the EDD, the first and second five-year review reports, a Site Review and Update conducted by the Agency for Toxic Substances and Disease Registry (ATSDR), and the MSD Guidance for Institutional Inspection, Monitoring, Maintenance and Operation Activities.

ARARs Review

A review of the Applicable or Relevant and Appropriate Requirements (ARARs) was conducted by the U.S. Army Corps of Engineers Center of HTRW Expertise, and its review follows.

The September 1986 EDD identified the following ARARs for the site:

- 40 CFR 263, Standards Applicable to Transporters of Hazardous Waste
- 40 CFR 264, Subpart F Groundwater Protection Standards
- 40 CFR 264, Subpart F Alternate Concentration Limit (ACL) provisions

The 40 CFR 263 standards for hazardous waste transporters applied during the drum/waste removal portion of the cleanup. Therefore, they are no longer germane to current activities at the site and are not further evaluated in this report.

In June of 1987, EPA established ACLs for the site. This established new (and higher) values for site contaminants than provided for in the 40 CFR 264 groundwater protection standards. The ACLs were developed by multiplying the applicable surface water quality standard for each contaminant of concern by the magnitude of dilution occurring when groundwater beneath the site discharges to the Ohio River. The previous dilution factor was 1,300, based on the minimum guaranteed flow downstream of Louisville, KY provided by the Corps of Engineers in 1987. In March 2003, the Hydraulics Branch of the U.S. Army Corps of Engineers (Louisville District) provided a 7-day, 10-year statistical low flow rate of 11,000 cubic feet per second (cfs). Groundwater discharges at a rate of 10 cfs along the Ohio River side of the site. Therefore, a dilution factor of 1,100 was used to establish a new set of ACLs. The 1987 Kentucky water quality standards used to establish ACLs are listed along with the current values in the following table:

Table 2 COMPARISON OF PREVIOUS ACLs TO NEW STANDARDS[1]						
Contaminant	Basis[2]	Old Standard[3] (mg/l)	Old ACL (mg/l)	New Standard[5] (mg/l)	New ACL[10] (Drought) (mg/l)	New ACL[11] (Lowest Seasonal) (mg/l)
	Ohio River Flow (cfs)		13,000[4]		11,000	30,700
	Dilution Factor		1,300		1,100	3,070
Arsenic	WAH	0.05	65	0.050	55	153.5
Barium	DWS	1.00	1300	2.0	2200	6140
Beryllium	**DWS**	**1.10**	**1430**	**0.000004[7]**	**0.0044**	**.01228**
Cadmium[6]	**WAH**	**0.012**	**15.6**	**0.0032**	**3.52**	**9.824**
Hexavalent Chromium	**OMS**	**0.05**	**65**	**0.016**	**17.6**	**49.12**
Copper [6]	**OMS**	**0.022**	**28.6**	**0.012**	**13.2**	36.84
Iron	WAH	1.00	1300	1.00	1100	3070
Lead (dissolved)[6]	**OMS**	**0.05**	**65**	**0.0049**	**5.39**	**15.043**
Manganese	DWS	0.05	65	0.05	55	153.5
Mercury	WAH	0.0002	0.26	0.00091	1.01	2.7937
Selenium	DWS	0.01	13	0.05	55	153.5
Zinc[5]	WAH	0.07	91	0.159	174.9	488.13
Benzene	CAG	0.0012[8]	1.56	0.0012[9]	1.32	3.684

1 - A change in a standard resulting in a new ACL value that is lower than the previous ACL value has been bolded and highlighted.

2 - WAH = Warm Water Aquatic Habitat
DWS = Drinking Water Supply (applicable at existing points of public water supply)
OMS = Standards applicable specifically to the main stem of the Ohio River
CAG = Cancer Advisory Group, EPA HQ

3 - The old standards listed are those provided in the 1993 Review of Response Action Report used to initially establish ACLs.

4 - Corps of Engineers minimum guaranteed flow downstream of Louisville, 13,000 cfs (1987).

5 - New Standards reflect current values in Kentucky Water Quality Standards regulations at 401 KAR 5:031.

6 - Values for these contaminants determined assuming a hardness of 140 per the previous review reports.

7 - Kentucky no longer has a WAH value for beryllium, therefore the current value used is from the DWS standard.

8 - The old value for benzene came from the Cancer Assessment Group at EPA HQ.

9 - The current standard is from the Kentucky DWS standard.

10- Corps of Engineers 7-day, 10-year statistical Ohio River flow rate, 11,000 cfs, computed in 2003.

11- Corps of Engineers lowest seasonal Ohio River flow rate, 30,700 cfs, computed in 2003.

Based upon changes to the Kentucky Surface Water Quality Standards, the ACLs have changed to significantly lower values for beryllium, cadmium, hexavalent chromium, copper and lead. Changes in standards have resulted in higher ACLs for barium, mercury, zinc, and selenium. While the standards for arsenic, iron, manganese and benzene have not changed, the change in the dilution factor from 1300 in 1987 to 1100 in 2003 resulted in lower ACLs for these contaminants.

Groundwater sampling data through April 2001 shows no apparent exceedances of the lower ACLs with the possible exception of beryllium. The new DWS standard for beryllium has resulted in a significantly lower ACL (from 1430 mg/l to 0.0044 mg/l). Groundwater data shows that sampling and analysis for beryllium is not being done at the site. Due to the extremely low ACL of 0.0044 mg/l, it is recommended that future groundwater sampling efforts include analysis for beryllium in order to demonstrate compliance with the ACL. When decision limits are re-evaluated, the adequacy of the analytical methodology to monitor the contaminants of concern with respect to the new decision limits should be specified.

Option to Recalculate ACLs Based Upon Historical River Flow Rate Data: EPA may wish to give consideration to reevaluating how the ACLs are calculated. To date, a historical low flow rate has been used. While very conservative in that it represents the very worst case scenario in river flow rates, it may be more realistic to use the most recent low season flow rate. A flow rate of 11,000 cfs represents a drought year. During drought years, the groundwater discharge rate will also be reduced. The Hydraulics Branch of the U.S. Army Corps of Engineers (Louisville District) provided the following flow rates for water years (WY) 1929 - 2001 for the Ohio River:

Ohio River Flow Rates*

Increment	WY 2001	WY1929-2001
Yearly	87,400cfs	115,700cfs
Winter	109,200cfs	160,200cfs
Spring	141,500cfs	196,100cfs
Summer	70,300cfs	61,900cfs
Fall	30,700cfs	46,000cfs

* Data taken downstream of the McAlpine Dam at approximately river mile 607.

Based upon this data, a more appropriate Ohio River flow rate of 30,700 cfs, the lowest seasonal flow, could be utilized to determine a dilution factor of 3,070 to calculate ACLs. While not

as conservative as the 1,100 dilution factor, it is more representative of actual flow conditions of the Ohio River.

Data Review

Data from several reports included in Attachment C were reviewed and analyzed as follows:

Attachment C-2, the checklist for the site inspection of February 25, 2003, prepared by MSD. The report indicated no distress to physical features such as ditches, rip-rap, and roads.

Attachment C-3 provides tabulations of groundwater contaminant concentrations in relation to performance standards for GW MWs-A,B,02, 04 and 05. Comparison of the contaminant concentrations from GW MWs-A,B,02 shows consistent detections above the SMCLs for iron and manganese, and a single detection above the MCL for antimony and cadmium. For GW MWs-04,05 and from 1995, there have been no detections of the contaminants of concern in the EDD, above the new, conservatively calculated ACLs. Beryllium, copper, hexavalent chromium, and filtered lead should be added to all future analyses of groundwater from these two monitoring wells.

Attachment C-4 provides tabulations of gas concentrations from the five gas monitoring wells (G-1,2,3,4,5) in relation to the 25% lower explosive limit (LEL). All readings were well below the 25% LEL, however, the levels of methane have dramatically increased since 1997. A plot of methane concentrations at these wells is provided as Attachment C-6.

Attachment C-5 provides tabulations of gas concentrations from the six current ambient air monitoring stations (R1, R2,R3,U1, A1, A2) in relation to the 25% lower explosive limit (LEL). All readings were well below the 25% LEL, however, the levels of methane have dramatically increased since 1997. A plot of methane concentrations at the ambient air sampling locations is provided as Attachment C-7.

Site Inspection

Inspection of the site was conducted on February 25, 2003 by representatives of the EPA, the KNREPC, the MSD, and the U.S. Army Corps of Engineers. The purpose of the inspection was to assess the protectiveness of the remedy, including the adequacy of site security measures. A complete list of inspection attendees is provided in Attachment C-1. Initially, the inspection team met off site at the main MSD maintenance facility, and the team was provided an overview of the remediation, monitoring, and O & M

activities that have been done. Temperature on the day of the inspection was about 20° F and there was a small amount of snow cover. Leaves and other vegetation had not developed and thus there was good visibility of the surface within wooded and brushy areas.

The pre-inspection briefing greatly facilitated understanding of the uniqueness of the site's contamination and associated remedial action. Additionally, on May 15, 2003, Messrs. Mathew Przystal of the Louisville Health Department, Richard Watkins of the Louisville Metropolitan Sewer District, and John Jent of the U.S. Army Corps of Engineers visited the site to document the presence of an elastic material noted at two locations within the landfill by Mr. Przystal. The following items were noted and comments made during the inspections: Figures and photos are included in Attachments A and B.

1. The access gate across the Lee's Lane entrance appears to be in good condition. It prevents motor vehicles from entering, but quad-runner ATVs can very easily go around the gates, see Photograph 1 and Figure 4.

2. The levee itself appears to be in good condition. It was constructed on original materials landward of the landfill, and has relatively flat, well maintained slopes. There is a newly constructed asphalt path on the levee South of Lee's Lane. At Lee's Lane, the path turns away from the levee and proceeds northeasterly along Lee's Lane, see Photograph 2 and Figure 4.

3. Although motor vehicles cannot travel along the asphalt path, pedestrians and quad-runner ATVs can. Cracking of the pavement indicates that it will begin to deteriorate rapidly under heavy traffic, see Photographs 5 and 6.

4. The ditch that extends approximately along the line of the subsurface gas collection wells has no outlet and thus ponds water. Based on a topographic map from 1961, Figure 8, drainage from this ditch was blocked by filling of the landfill within the Central Tract. In some cases, the level of the ponded water is above the top of individual gas collection wells, see Photographs 2,3,4 and Figures 4,5, and 8.

5. The wooded area between the gas collection system and the capped area is very rough and hummocky, see Photograph 7.

6. The rock-lined ditch at the north end of the rip-rap appears in good condition. The wooded area (Northern Tract) directly

north of the ditch appeared stable and little or no rubbish was present on the surface, see Photograph 8 and Figure 2.

7. The rip-rap placed at the Ohio River bank along the Central Tract appears very stable, unweathered and of adequate size. No erosional activities or seeps were noted along the river bank. Small amounts of brush were present at the base of the rip-rap along the river, see Photograph 9.

8. As shown in photographs 10 A and B, settlement monuments within and outside the rip-rap area appeared to be stable.

9. The capped area immediately landward of the rip-rap appeared relatively flat with no major surface depressions observed. There was some severe rutting across the cap due to uncontrolled, trespasser, quad-runner ATV traffic, see Photograph 11.

10. Sediment and debris have blocked the shale-lined ditch across the capped area where it meets the rip-rap area, see Photograph 12 and Figure 4.

11. The corrugated metal pipe beneath the access road at the shale-lined ditch has a large amount of sediment buildup at its downstream end and thus ponds water at the upper end, see Photographs 13 A,B and Figure 4.

12. The access road to the South Tract has only a thin cover of gravel and is severely rutted, due mostly to the uncontrolled trespasser quad-runner ATV traffic, see Photograph 14 and Figure 2.

13. The South Tract is somewhat hummocky and contains a fairly dense group of trees and debris.

14. Uncontrolled trespasser quad-runner ATV traffic has created many ruts and large bare areas adjacent to both sides of Putnam Street at the riverside toe of the levee. Additionally, there is a rather large pond about 300 feet in diameter that poses a danger to trespassers, see Photograph 16.

15. Although there appears to be much uncontrolled trespassing, the site gas and groundwater monitoring wells, the gas collection wells, the gas collection blower house, and the settlement monuments do not appear to have been interfered with by trespassers.

16. The blower house for the subsurface gas collection system has many pipes and controls. Mr. Mike Humphrey of MSD indicated that the only maintenance that MSD performs is to replace burnt-out motors. The system runs continuously. He said MSD has no operations and maintenance manual for the system, no as-built drawings, and generally has no way of adequately monitoring the performance of the system, see Photographs 4 and 17, and Figure 5.

17. Traffic access to the landfill via Putnam Road is blocked by a guard rail barrier as shown in Photograph 18.

18. A water meter and a fire hydrant present along Putnam Road indicate that municipal water is available to local residents.

19. On May 15, 2003 an elastic material, possibly a resin, was noted at the surface of the landfill at the location noted on Figure 4 and Photographs 20 A,B. The surface lateral extent was approximately 3' wide by 10' long, and the material extended about a foot above the adjacent surface. No odors were noted.

20. On May 15, 2003 the remains of a buried 55-gallon drum with material similar to that noted in 19 above was noted at the location shown on Figure 4 and Photograph 21.

Site Inspection Summary

1. Although the MSD is responsibly and aggressively performing O&M of the landfill, it has been hampered by not having key project documents in its custody for reference by those in charge of the field equipment. The O&M manual and as-built drawings for the subsurface gas collection system should be readily available to MSD.

2. Site security issues have historically been a major problem and are currently of concern. Uncontrolled trespasser quad-runner ATV traffic significantly degrades site access, could destroy surface cover, and could be a significant liability issue. Although, there is no known damage to the site due to trespassers to date, there is a high potential for vandalism to site facilities such as the monitoring wells and monitoring equipment. In addition, the recent construction of a new asphalt pedestrian pathway by the City of Louisville along the levee at the site provides a new environmental exposure route and possible safety and liability issues. The MSD, the City of Louisville, and the EPA need to evaluate the adequacy of current site security and

potential liabilities associated with the present situation of easy access to the site.

3. Other major components of the remediation, such as the rip-rap erosion protection along the Ohio River bank, the clay cap over the landfill, and the on-going monitoring activities are satisfactory at this time.

4. Several drainage related concerns were observed, including:
   A. Sediment build-up within the corrugated metal pipe along the shale-lined drain beneath the access road across the clay cap, and poor grade in the ditch where it intersects the rip-rap area to facilitate drainage down the rip-rap slope.
   B. Inadequate outfall for the ditch adjacent to the line of subsurface gas collection wells.

5. The access road through the South Tract is currently barely passable due to a combination of its steep slope and trespasser quad-runner ATV traffic.

6. The elastic material noted at two locations within the landfill needs to be sampled and analyzed to determine its potential for adverse human health or ecological effects.

Additional Inquiry

Following the site inspection, contact was made with Mr. James J. Walsh of SCS Engineers to discuss the current situation. SCS Engineers was the firm that initially designed and installed the subsurface gas collection system and later repaired it. Mr. Walsh provided a letter describing his company's involvement and recommended that the subsurface gas collection system be thoroughly investigated at the earliest possible date. A copy of this correspondence is provided as Attachment C-9.

Community Involvement Activities

In March 2003, the US EPA announced that the remedy at the site was under review in the local newspaper, conducted telephone interviews with local residents and invited comments on activities related to the site. Responses to the interviews were mixed. Some people were pleased overall and some expressed displeasure with the method and extent of the cleanup implemented at the site. In any case, no one identified a specific problem to indicate that the objectives of the remedy at the site are not being met currently. Copies of the telephone interviews are in Attachment C-8. One interviewee noted an elastic material present at two locations

within the landfill. These two locations were inspected, and the material observed did not appear to be of any significance relative to the remedial action in place.

VII. Technical Assessment

Question A: Is the remedy functioning as intended by the decision documents ?

The review of documents, ARARs, risk assumptions, groundwater and gas monitoring well data, and the results of the site inspection indicate that the remedy has functioned to this point as intended by the EDD. The remedial actions have achieved the remedial objectives of preventing the migration of potentially explosive gases from the landfill to the Riverside Gardens subdivision, minimizing on-site exposure, minimizing off-site exposure, and providing adequate level of site security. The connection of all Riverside Gardens subdivision residents to municipal water has significantly reduced environmental risk to the adjacent residents. Increasing concentrations of methane gas levels in both the gas monitoring wells and ambient air sampling, however, indicate a very strong need for an extensive evaluation of the subsurface gas collection system.

Although the MSD is attempting to responsibly and aggressively perform O&M of the landfill, it has to this point been hampered by not having key project documentation in the possession of those now charged with performing the O&M. The MSD should have in its possession an operations and maintenance manual and as-built drawings for the subsurface gas collection system, the key component of the remedial action. Contact and coordination with the firm that constructed the subsurface gas collection system should be done at the earliest possible time. The MSD is currently doing an excellent job of performing the required site inspections and facilitating the required groundwater and gas sampling and analysis. However, the results of the sampling analyses need to be better evaluated, both within the context of historical data to determine trends, and within the regulatory context, relative to the ACLs and 25% LELs, to ensure that measured levels are below action levels.

Although the MSD has taken every practical measure to provide site security, the construction of a pedestrian path along the levee top and the large amount of uncontrolled trespasser quad-runner ATV traffic require that the MSD, the City of Louisville, and the EPA further consider the limits and ramifications of site security measures.

Question B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of the remedy selection still valid ?

The connection of all Riverside Gardens residents to municipal water supply has removed the groundwater exposure scenario for nearby residents. An ARARs review conducted by the U.S. Army HTRW Center of Expertise, provided new Alternate Concentration Limits (ACLs[5]) to be utilized for groundwater monitoring wells MW-4 and MW-5, i.e., the two wells being monitored for groundwater flow into the Ohio River. This re-analysis is provided in the ARARs Review above. Since all residents adjacent to the project are now connected to a municipal water supply, there is no need to continue monitoring Groundwater Wells MWs-A, B, and 02 since there is no longer a complete pathway for groundwater exposure.

New Kentucky Water Quality Standards require additional laboratory analyses for the groundwater samples from Groundwater MWs-04,05. Based on the review of ARARs, future groundwater samples should be analyzed for beryllium and copper, hexavalent chromium (instead of total chromium) and filtered lead (instead of total lead) in addition to those analyses currently specified. When decision limits are re-evaluated the adequacy of the analytical methodology to monitor the contaminants of concern with respect to the new decision limits should be evaluated. Finally, updated exposure parameters and human health risks may need to be developed for the site in view of the newly constructed path at the top of the levee. Additionally, the MSD, the City of Louisville, and the EPA need to re-evaluate the risks and liabilities, both environmental and safety, due to the uncontrolled trespasser quad-runner ATV traffic.

Question C: Has any other information come to light that could call into question the protectiveness of the remedy ?

Increasing concentrations of methane gas levels, in both the gas monitoring wells and ambient air sampling, indicate the need for an extensive evaluation of the subsurface gas collection system. Mr. James J. Walsh of SCS Engineers, the firm that initially designed, installed, and later repaired the subsurface gas collection system, recommended that the subsurface gas collection system be thoroughly investigated at the earliest possible date to determine if the system is adequately preventing potentially explosive gases from migrating from the landfill to the Riverside Gardens subdivision.

Technical Assessment Summary

The remedial actions at this site to date have achieved the remedial objectives of preventing the migration of explosive gases from the landfill to the Riverside Gardens subdivision, minimizing on-site exposure, minimizing off-site exposure, and providing adequate level of site security. Connection of all Riverside Gardens subdivision residents to municipal water has significantly reduced environmental risk to the adjacent residents. However, increasing concentrations of methane gas in both the gas monitoring wells and ambient air sampling, in addition to the opinion of the remediation system's designer, indicate a strong need for a comprehensive evaluation of the subsurface gas collection system. Appropriate measures, limits, and liabilities associated with new pedestrian traffic adjacent to the landfill and uncontrolled trespasser quad-runner ATV traffic need to be evaluated by the MSD, the City of Louisville, and the EPA.

VIII. Issues

Table 3 Issues	Affects Current Protectiveness (Y / N)	Affects Future Protectiveness (Y / N)
Project documentation is not available to the project operators.	N	Y
Although measured methane gas levels are still below the ARARs limits, recent dramatic increases in those levels question the adequacy of the subsurface gas collection system.	N	Y
The main drainage way across the capped portion of the landfill is blocked.	N	Y
The access road to the Southern Tract is almost impassable.	N	Y
Pedestrian flow across a newly constructed walkway along the levee adjacent to the project and significant trespasser incidence present liability problems for the agencies charged with overseeing the project.	N	Y
New Kentucky Water Quality Standards require additional analyses for the groundwater samples from Groundwater MWs-04,05.	N	Y
Since all residents adjacent to the project are now connected to a municipal water supply, there is no longer a need to sample/analyze groundwater from Groundwater MWs-A, B and 02.	N	N

IX. Recommendations and Follow-up Actions

1. Maintain already programmed O&M activities currently undertaken by MSD and increase the oversight by KNEPC.

2. Proactively address issues listed in Tables 3 and 4 of this report.

Table 4: Recommendations and Follow-up Actions

Issue	Recommendations and Follow-up Actions	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness (Y/N)	
					Current	Future
1	Complete Re-Evaluation of the Subsurface Gas Collection System	MSD/ KNREPC	EPA	Dec 2003	N	Y
2	Re-Evaluate Site Security Measures, Limits, and Liabilities	MSD/City of Louisville / KNREPC	EPA	Dec 2003	N	Y
3	Improve Site Drainage (Ditch Along Line of Wells & Blocked Ditch & Drain Pipe Under Access Road)	MSD	EPA/ KNREPC	Dec 2003	N	Y
4	Evaluate Site Monitoring Data	MSD	KNREPC	Dec 2003	N	Y
5	Re-Establish Information Repository (possibly at MSD Maintenance Bldg)	MSD	KNREPC	Dec 2003	N	Y
6	Develop Coordination Plan to Implement (1-5)	MSD	KNREPC	Sep 2003	N	Y
7	Discontinue Sampling of GW MWs-A, B, and 02	MSD	KNREPC	Present	N	N
8	Add Laboratory Analyses as Required by New KY Water Quality Standards on Samples from GW MWs-04,05	MSD	KNREPC	Present	N	Y

X. Protectiveness Statement

The remedy at the Lee's Lane Landfill currently protects human health and the environment, because it significantly reduces the migration of explosive gases from the landfill and minimizes on-site and off-site exposure to contamination. In order for the remedy to be protective in the long-term, a re-evaluation of the subsurface gas collection system is recommended by December 2003, and any necessary repairs to the system should be initiated as soon as possible. Although every practical site security measure has been taken, the limits and liabilities of current measures need to be re-evaluated in terms of pedestrian traffic adjacent to the landfill and the uncontrolled trespasser quad-runner ATV traffic.

XI. Next Review

The next Five-Year Review is due by June 30, 2008.

Attachment A Figures

Figure 1	Site Map
Figure 2	Site Layout
Figure 3	Monitoring Locations
Figure 4	Site Inspection Map
Figure 5	Subsurface Gas Collection System
Figure 6	Cross-Section of Landfill
Figure 7	1998 Aerial Photograph of Site
Figure 8	1961 Topographic Map of Site
Figure 9(A-E)	Descriptions of Landfill Sections

Attachment B Photographs

Photograph 1	Entrance Gate at Lee's Lane
Photograph 2	View Looking North Along the Levee from the Lee's Lane Crossing
Photograph 3	Top of Gas Collection Well #28 Under Water Ponded in the Ditch Parallel to the Line of Gas Collection Wells
Photograph 4	Blower House and Gas Collection Wells from Lee's Lane
Photograph 5A,B	View Looking South Along the Levee from the Lee's Lane Crossing
Photograph 6	Approach to Landfill Along Lee's Lane
Photograph 7	Central Track Wooded, Hummocky Area
Photograph 8	Rock-Lined Ditch at North End of Central Tract and Wooded Northern Tract
Photograph 9	Rip-Rap Bank Protection
Photograph 10	Settlement Monuments
Photograph 11	Ruts Along Capped Area
Photograph 12	Blocked Shale-Lined Drainage Ditch Across Capped Area at the Top of the Rip-Rapped Slope
Photograph 13A,B	Ponded Water Upstream of Drainage Pipe Blockage
Photograph 14	Access Road in Southern Track
Photograph 15A,B	Debris and Hummocky Surface in Southern Tract
Photograph 16	Ruts and Eroded Surface Due to Quad-runner ATV Traffic; View from Putman Road Looking South

Photograph 17	Piping at the Subsurface Gas Collection Blower House
Photograph 18	Barrier Across Putnam Road
Photograph 19A,B	Water Meter and Fire Hydrant Along Putnam Road
Photograph 20A,B	Elastic Material Observed at the Surface
Photograph 21	Buried Drum with Elastic Material

Attachment C Forms

1 5-Year Review Site Inspection Attendees
2 5-Year Review Site Inspection Checklist (from MSD)
3 Groundwater Monitoring Data
4 Gas Monitoring Well Data
5 Ambient Air Monitoring
6 Plot of Methane Measurements in Gas Monitoring Wells
7 Plot of Methane Measurements in Ambient Air
8 Telephone Interviews
9 Correspondence with SCS Engineers

Attachment A

Figures

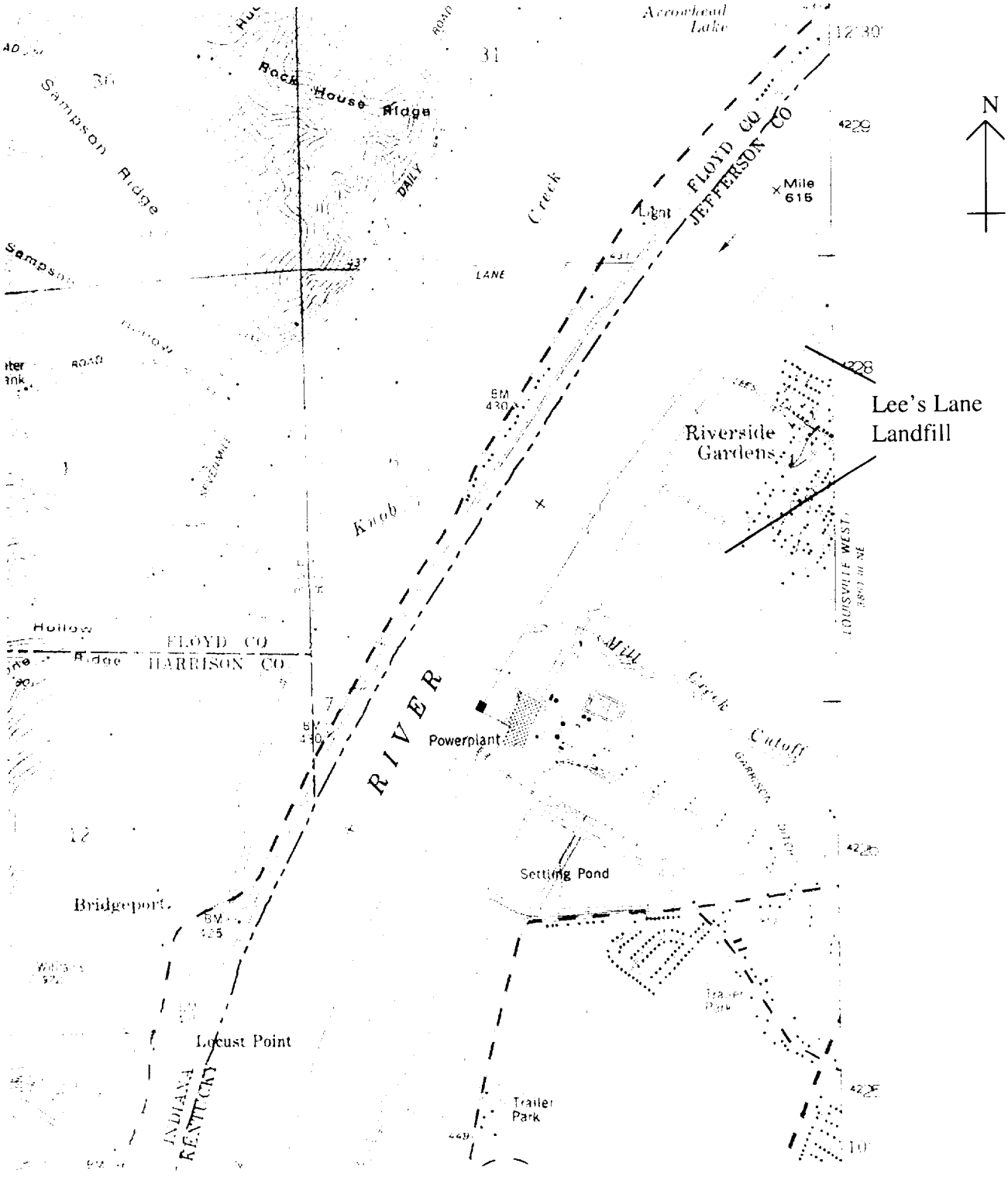
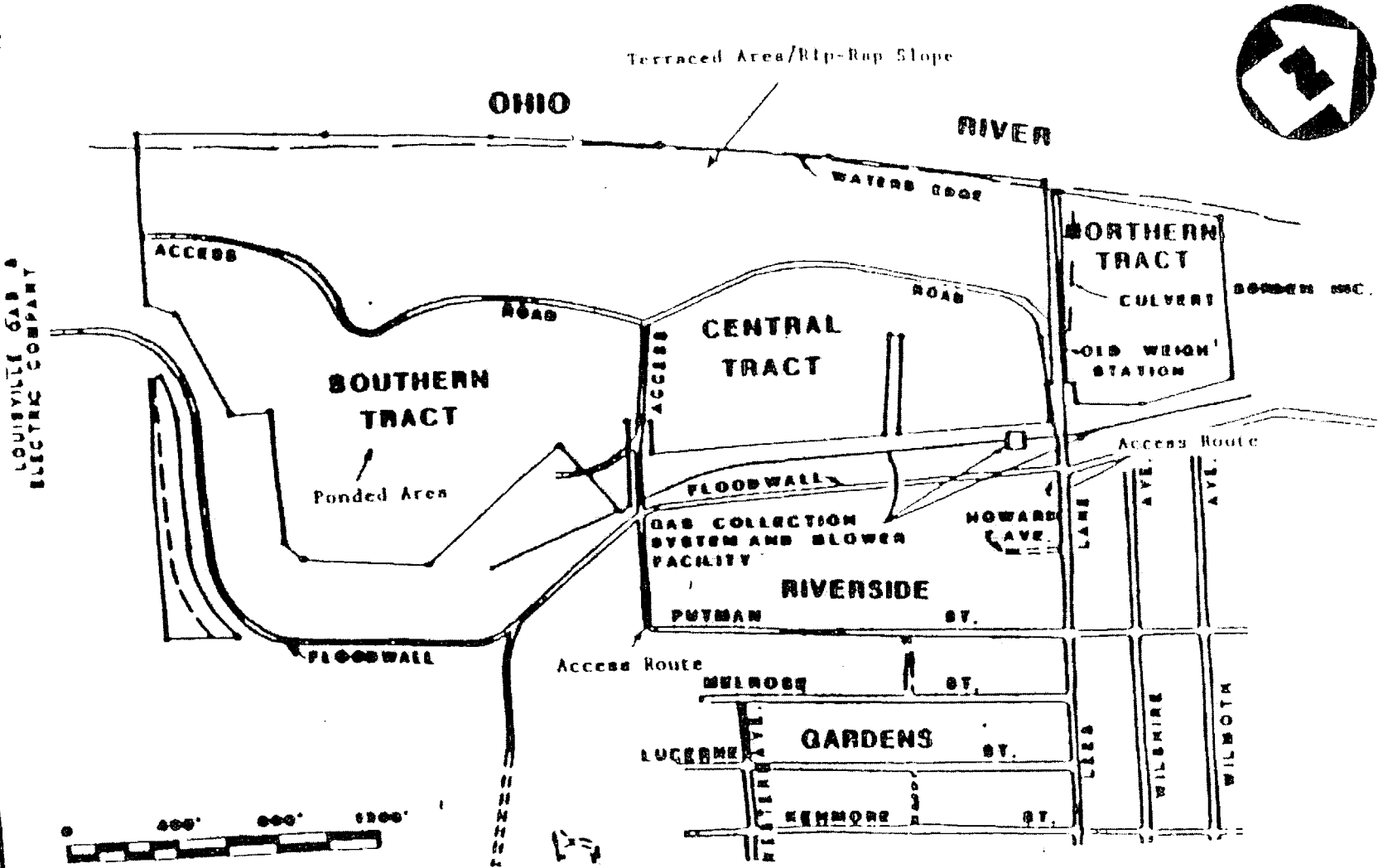


Figure 1
Site Map
Lee's Lane Landfill



SITE LAYOUT
LEE'S LANE LANDFILL SITE
JEFFERSON COUNTY, KENTUCKY

Figure 2
Site Layout
Lee's Lane Landfill

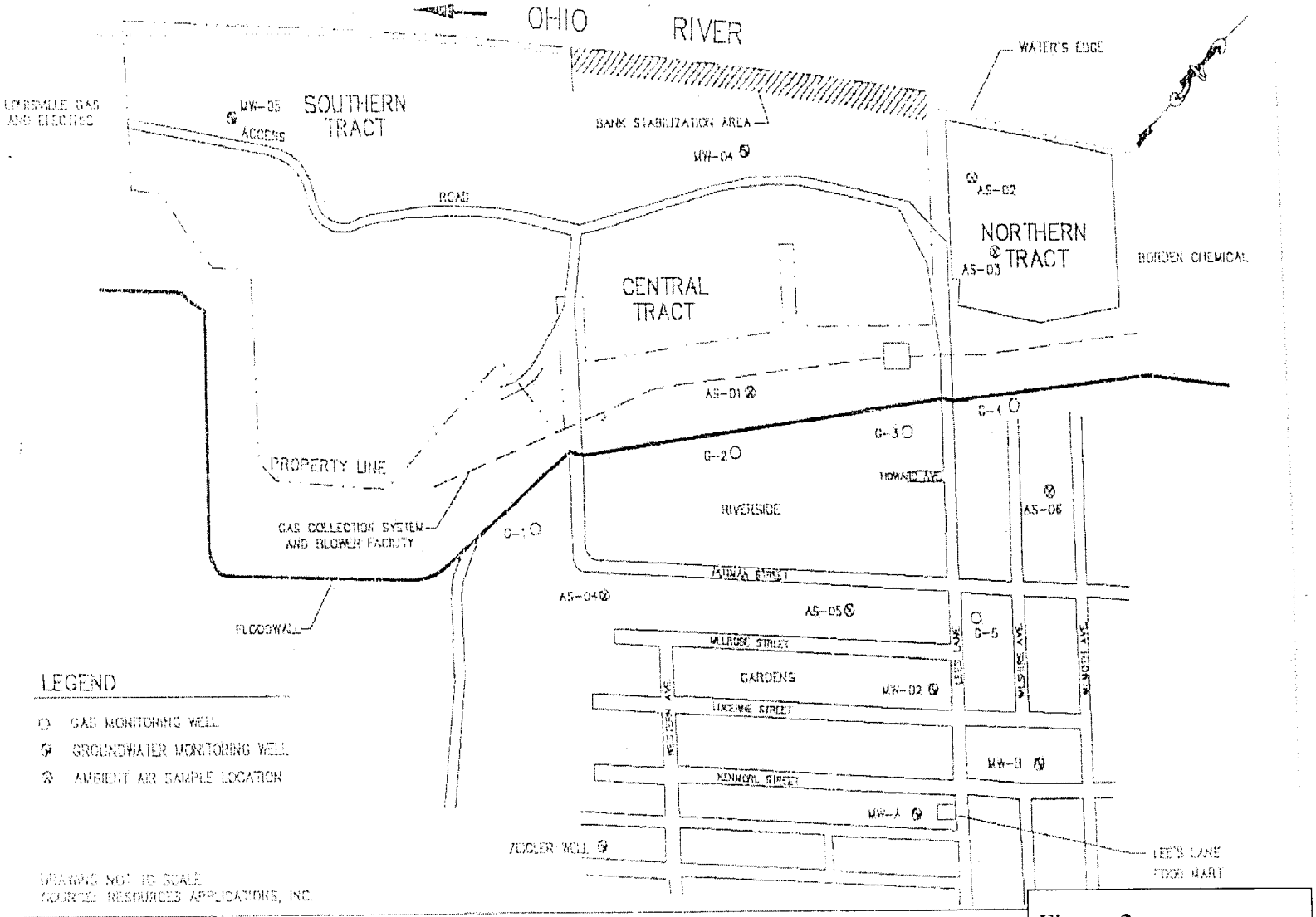
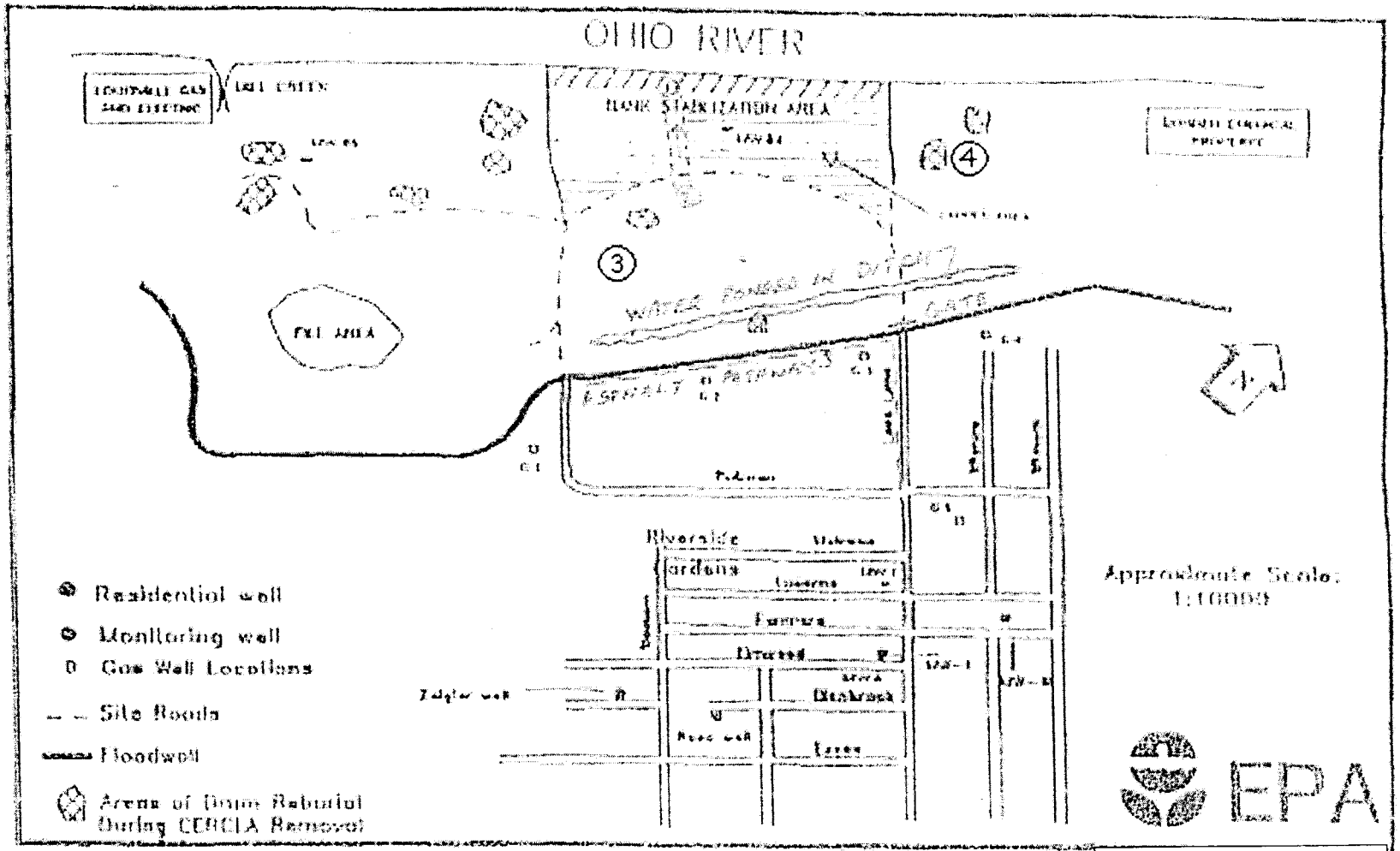


Figure 3
Monitoring Locations
Lee's Lane Landfill

③ ELASTIC MATERIAL OBSERVED AT SURFACE

④ BURIED DRUM WITH ELASTIC MATERIAL



WESTON SPER Region IV TAT

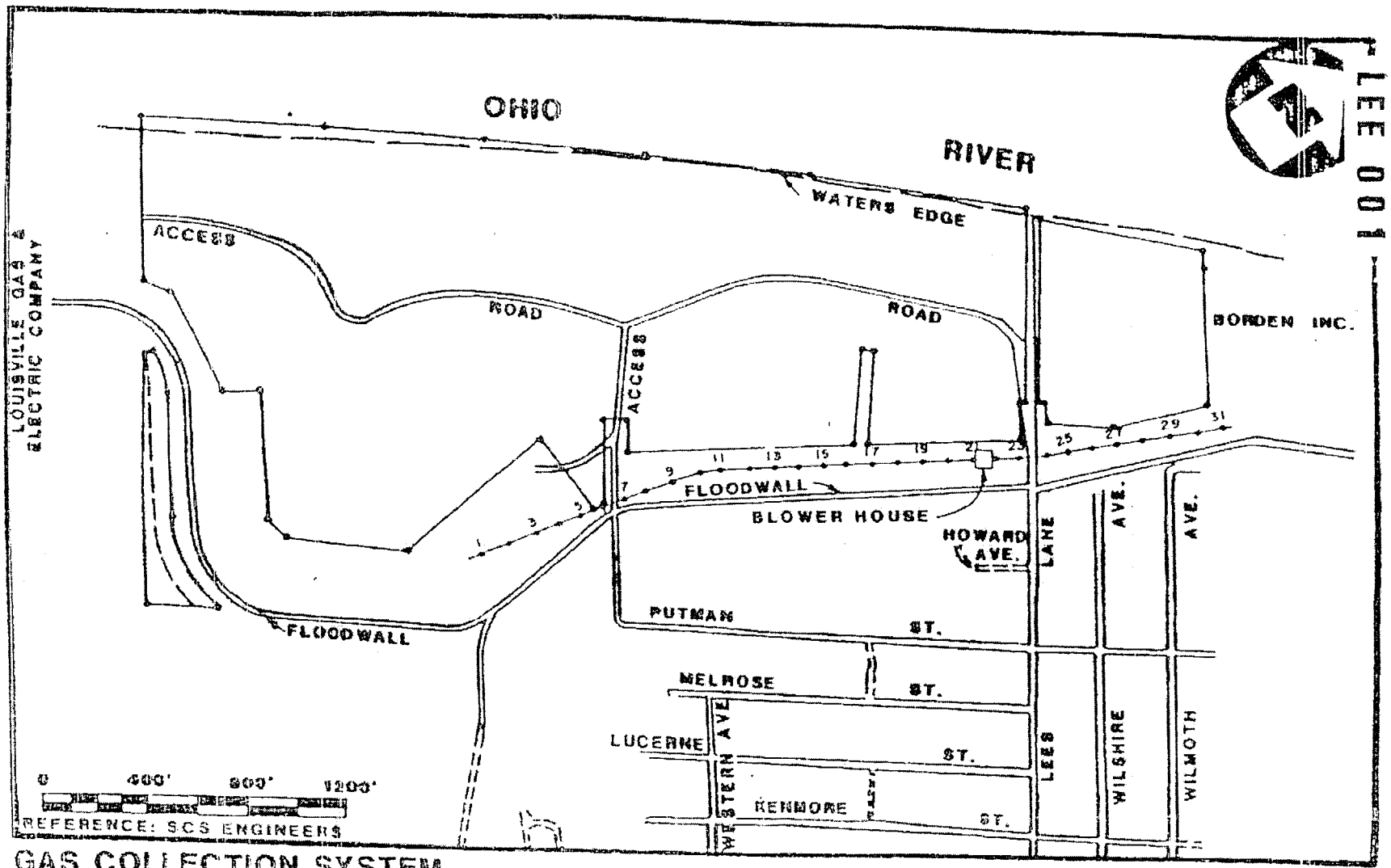
ACTIVITY DESCRIPTION: Map of site showing well locations

SITE: Lees Lane Landfill

EPA ID NO.: KYD-980558-276

DATE: 26 August 1988

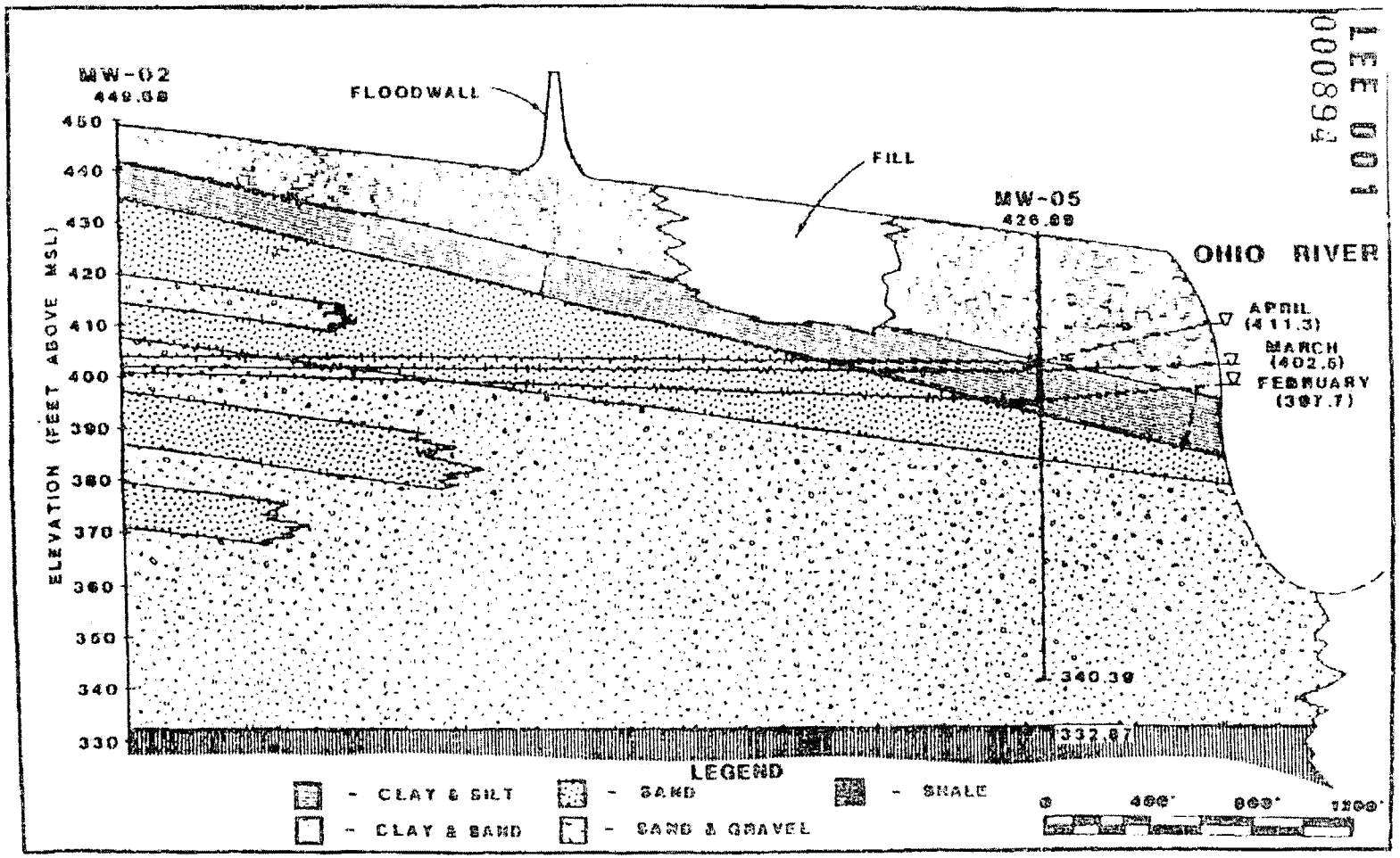
Figure 4
Site Inspection Map
Lee's Lane Landfill



GAS COLLECTION SYSTEM
LEES LANE LANDFILL SITE
JEFFERSON COUNTY , KENTUCKY

FIGURE 6-3

Figure 5
Subsurface Gas Collection System
Lee's Lane Landfill



CROSS-SECTION MW-02 - MW-05

LEES LANE LANDFILL SITE

JEFFERSON COUNTY, KENTUCKY

FIGURE 4-4

Figure 6
Cross-section of Landfill
Lee's Lane Landfill

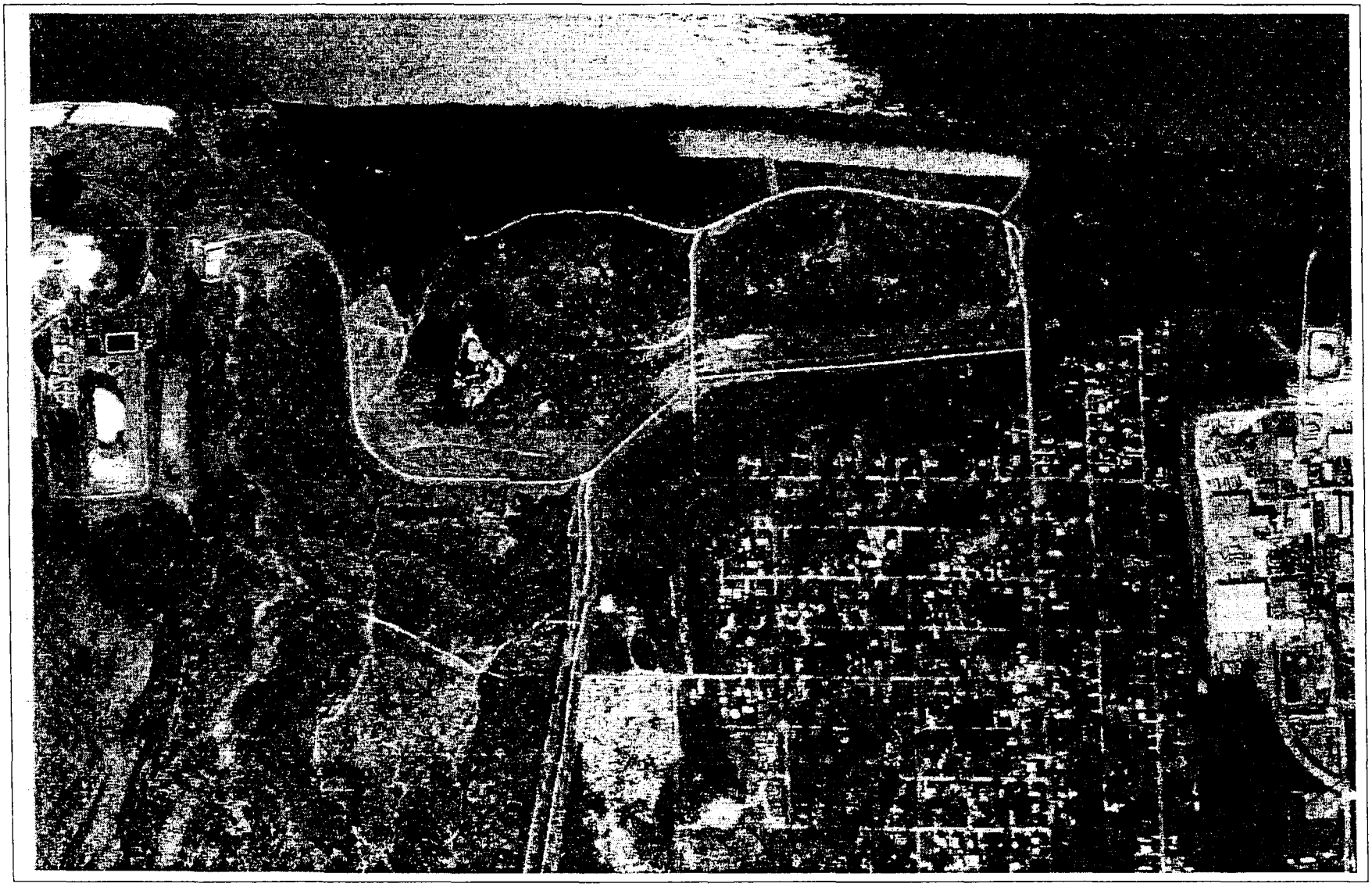


Figure 7
1998 Aerial Photo of site
Lee's Lane Landfill

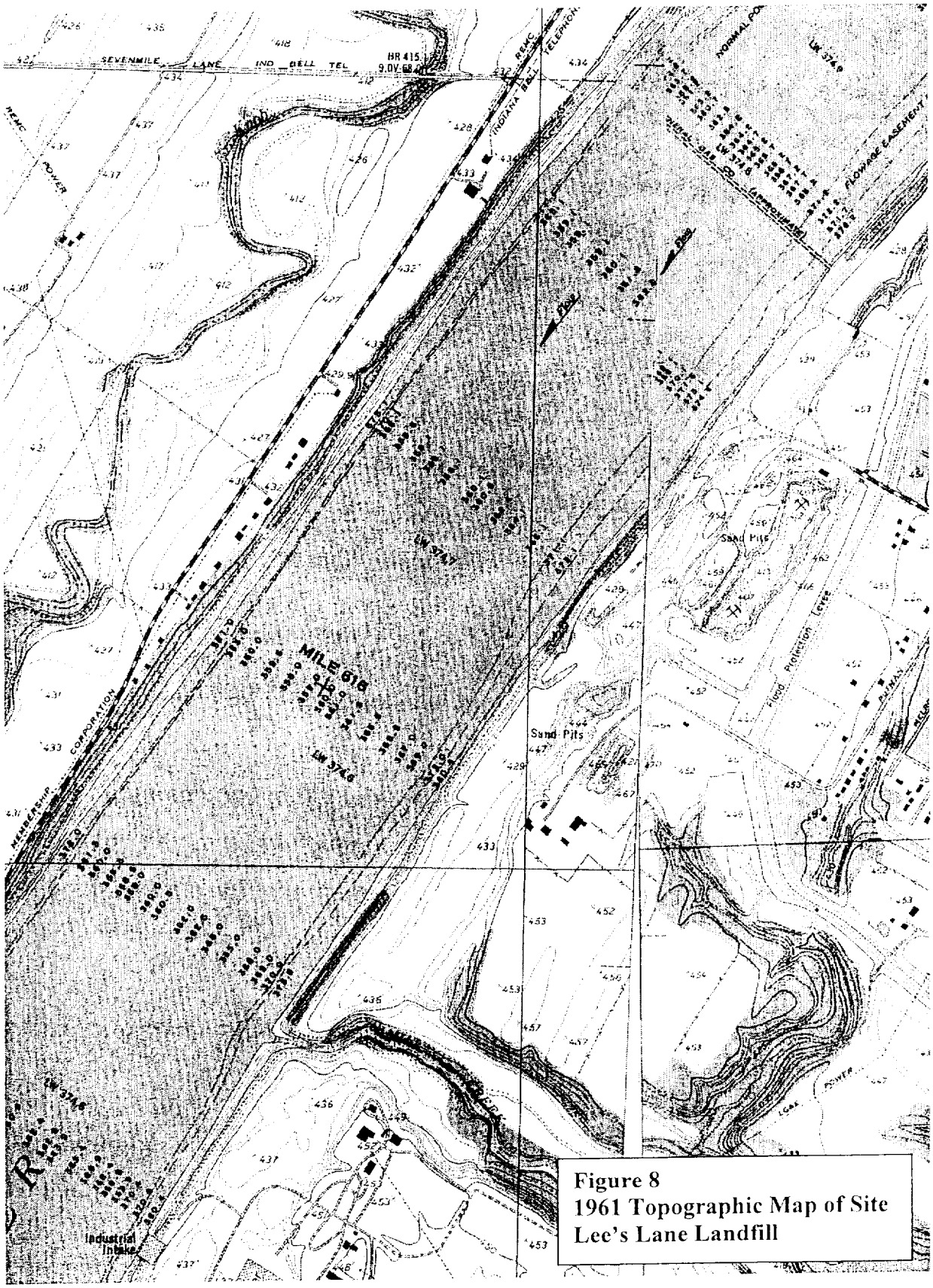
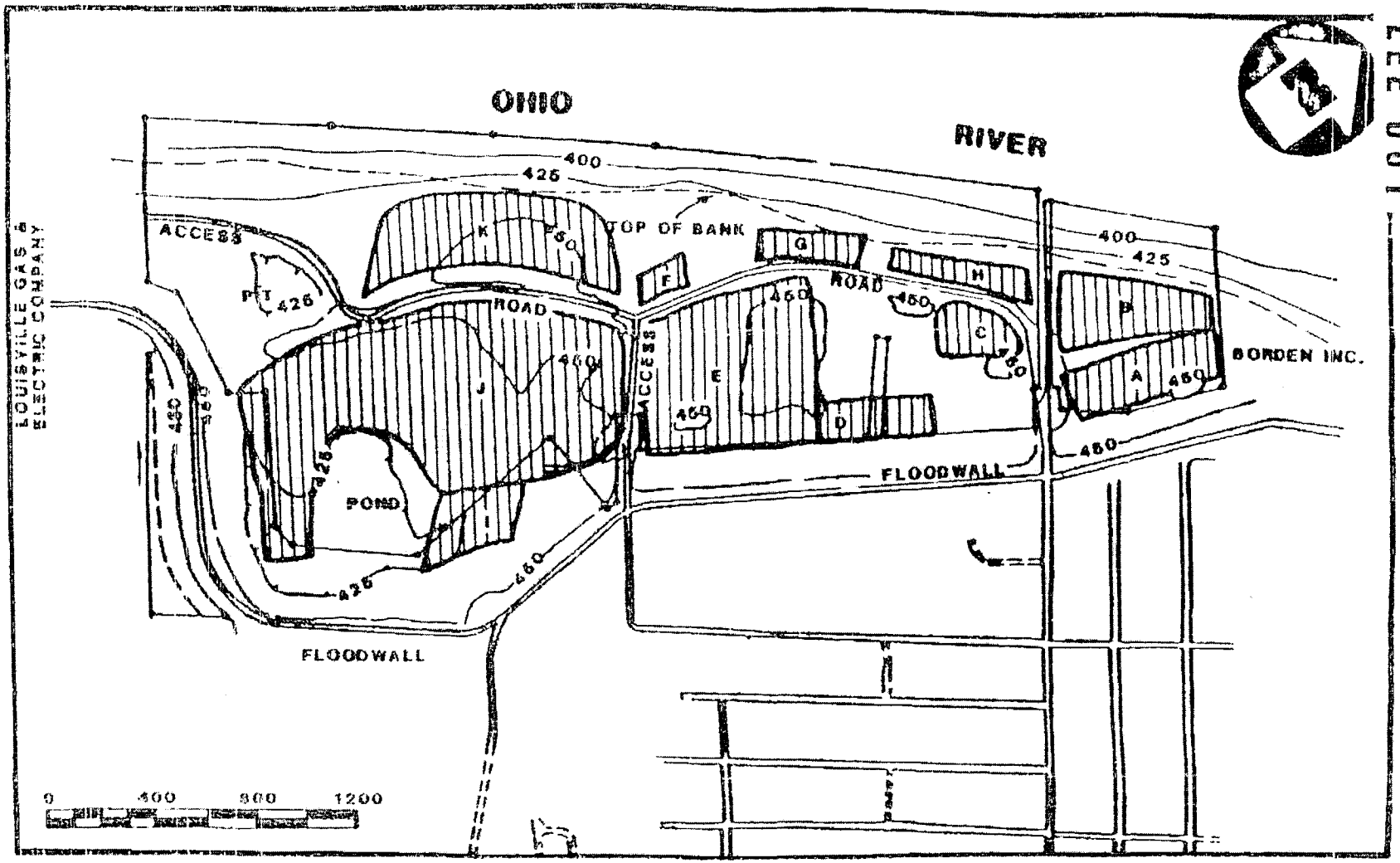


Figure 8
1961 Topographic Map of Site
Lee's Lane Landfill



AREAS USED TO CALCULATE FILL VOLUME

LEES LANE LANDFILL SITE

JEFFERSON COUNTY, KENTUCKY

FIGURE 3-9

Figure 9A
Description of Landfill Sections
Lee's Lane Landfill

LEE 001
000868

TABLE 3-2
AREA AND DEPTH VALUES
USED TO CALCULATE WASTE VOLUME
LEES LANE LANDFILL SITE
JEFFERSON COUNTY, KENTUCKY

Section	Estimated Surface Area (acres)	Estimated Waste Depth (feet)	Estimated Volume (cubic yards)
	Northern Tract		
A	3.2	40	206,000
B	6.2	25	250,000
	Central Tract		
C	2.7	5	22,000
D	1.2	5	9,700
E	13.0	25	524,000
F	0.62	20	20,000
G	1.8	20	58,000
H	1.9	20	61,000
	Southern Tract		
I	2.7	25	109,000
J	20.9	25	843,000
K	7.9	25	319,000

Notes: See Figure 3-9.

Figure 9B
Description of Landfill Sections
Lee's Lane Landfill

3.3.1 Northern Tract

The approximate volume of waste in the Northern Tract has been estimated at 2.56×10^5 cubic yards based on the assumptions presented below.

Section A — A large magnetic anomaly was delineated in the eastern portion of the Northern Tract. A well log from the installation of a Phase IV gas monitor well by SCS Engineers showed a refuse depth of approximately 40 feet.

Section B — Both the historical photographs and the magnetic surveys indicated possible disposal activity in this area. Based on the rapid slope of the land surface near the river as shown on the available topographic maps, the average depth of the fill material in this area was assumed equal to 25 feet.

3.3.2 Central Tract

The approximate volume of waste in the Central Tract has been estimated at 6.95×10^5 cubic yards based on the assumptions presented below:

Sections C,D — Most of the northern portion of the Central Tract between the levee and the access road was used as an auto junkyard. It is assumed that the activity in this area was limited to surface storage of junk. The surface scaring and staining liquids seen on several aerial photos was assumed to be due to the moving and storing of old automobiles. It is believed that excavation did not occur in this area. A minimal depth of 5 feet is assumed for these areas to allow for seepage of oils and grease into the soils.

Figure 9C
Description of Landfill Sections
Lee's Lane Landfill

Section E — The southern portion of the Central Tract between the levee and the access road was used for disposal of waste. Since there is evidence of continuous traffic across this section it is assumed that the excavated depth was relatively uniform. Gas monitor wells installed by SCS Engineers in 1979 indicated a refuse depth between 20 and 25 feet below the surface. 25 feet was the depth used to calculate the volume.

Sections F,G,H — Historical photographs indicate that excavation and filling activity occurred in several areas between the access road and the river. A monitor well installed in section F indicates a fill depth of 20 feet. It is assumed that the excavation and fill activity was limited to areas that did not extend beyond the river bank bluff. Therefore, a 20-foot fill depth was assumed for these areas.

3.3.3 Southern Tract

The approximate volume of wastes in the Southern Tract has been estimated at 1.27×10^6 cubic yards based on the assumptions presented below. Because of the size and topography of the two depressions in the Southern Tract, it is believed that wastes were not buried in either of these areas.

Section I — Historical photographs indicate continuous excavation and filling activity. The magnetometer survey showed high anomalous areas. An average depth of 25 feet was assumed based on physical features and topographic information.

Section J — From historical photographs this area was, apparently, where most of the mining operations occurred after

Figure 9D
Description of Landfill Sections
Lee's Lane Landfill

1950. Present topographic information and suspected slope of the pit during activity suggest an average fill depth of 25 feet within this section.

Section K — Historial photographic interpretation shows excavation and fill activity were limited to areas off the river bank. Topographic information and physical features indicate a possible fill depth of 25 feet.

3.4 Waste Containment

Containment of leachate generated by the wastes can not be expected based on the available information concerning the geologic conditions and operation of the landfill site. There are no known liners or leachate collection systems currently in operation at the site. The natural materials in the alluvial aquifer beneath the landfilled area were estimated to have a permeability of 8.90×10^{-3} cm/sec based upon in-situ hydraulic conductivity tests conducted on MW-04 (see Section 4.3.4.2 the discussion of permeabilities.) The soils above the aquifer are estimated to be an order of magnitude less permeable than the alluvial aquifer.

Observations recorded during the RI noted the apparent continued subsidence of the landfill as evidenced by relatively large depressions in the access road. These observations suggest that compaction may still be occurring at the site.

Since there are no available measurements on the permeability of the cover material at the landfill, the rate of percolation of rainwater and river water through the surface soils cannot be determined. Although the surface has not been graded to promote drainage, very little ponding was noted during the RI. Visual evidence suggests that the landfill cover does not appear to be capped with soils that would inhibit infiltration of surface waters.

Generally, the thicker the fill, the more concentrated the leachate will become. Quality of the leachate is a function of the composition, degree of compaction,

Figure 9E
Description of Landfill Sections
Lee's Lane Landfill

Attachment B

Photographs

Photograph 1 - Entrance Gate at Lee's Lane

Photograph 2 - View Looking North Along the Levee from the Lee's Lane Crossing

Note Gas Collection Wells at Left

Photograph 3 - Top of Gas Collection Well #28 Under Water Ponded in the Ditch Parallel to the Line of Gas Collection Wells

Photograph 4 - Blower House and Gas Collection Wells from Lee's Lane

Photograph 5A - View Looking South Along the Levee from the Lee's Lane Crossing

Note Asphalt Walkout Along Top of Levee

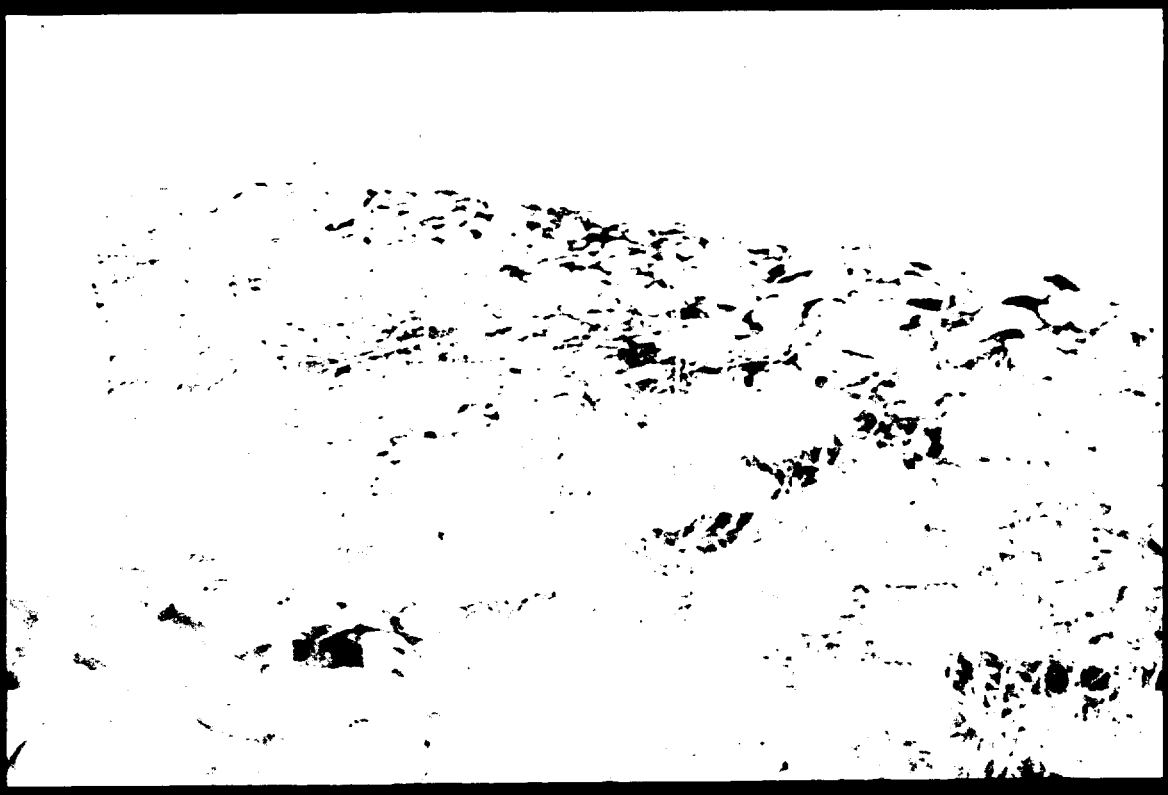
Photograph 5B - View Looking South Along the Levee from the Lee's Lane Crossing

Photograph 6 - Approach to Landfill Along Lee's Lane

Photograph 7 - Central Track Wooded, Hummocky Area

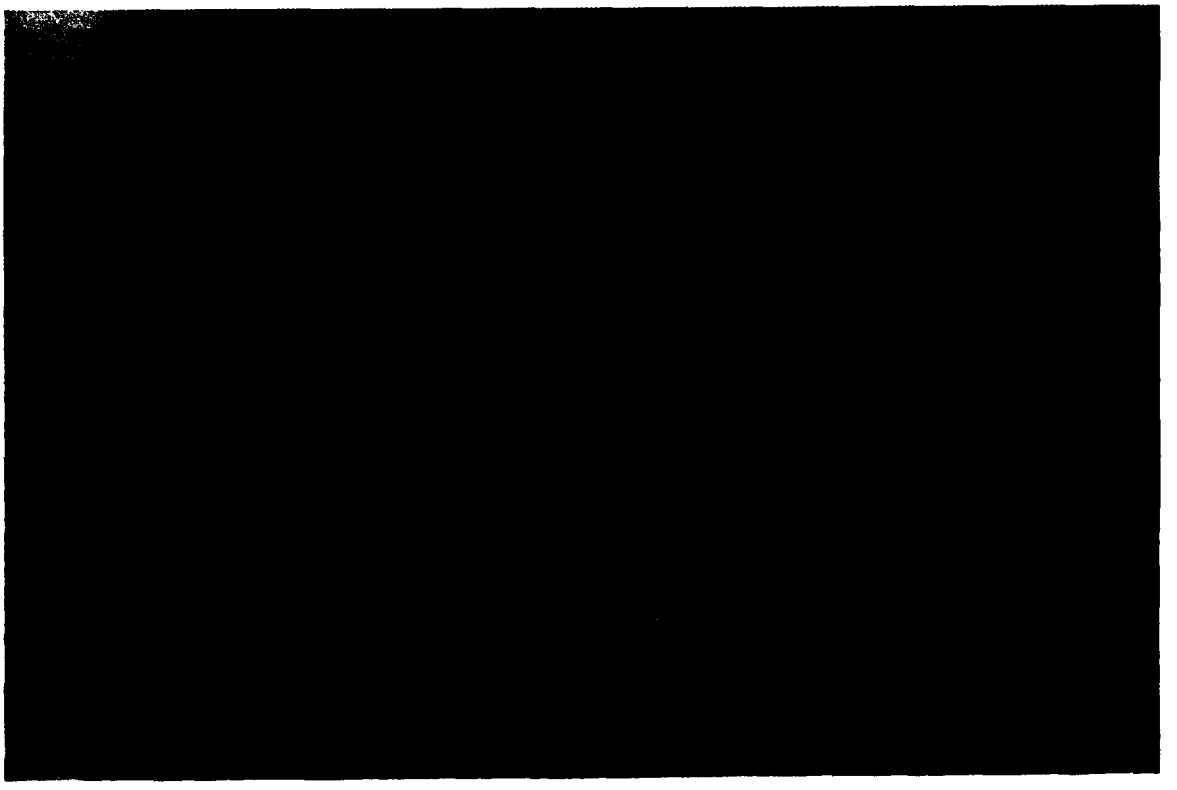
Photograph 8 - Rock Lined Ditch at North End of Central Tract and Wooded North Tract

Photograph 9 - Rip-Rap Bank Protection



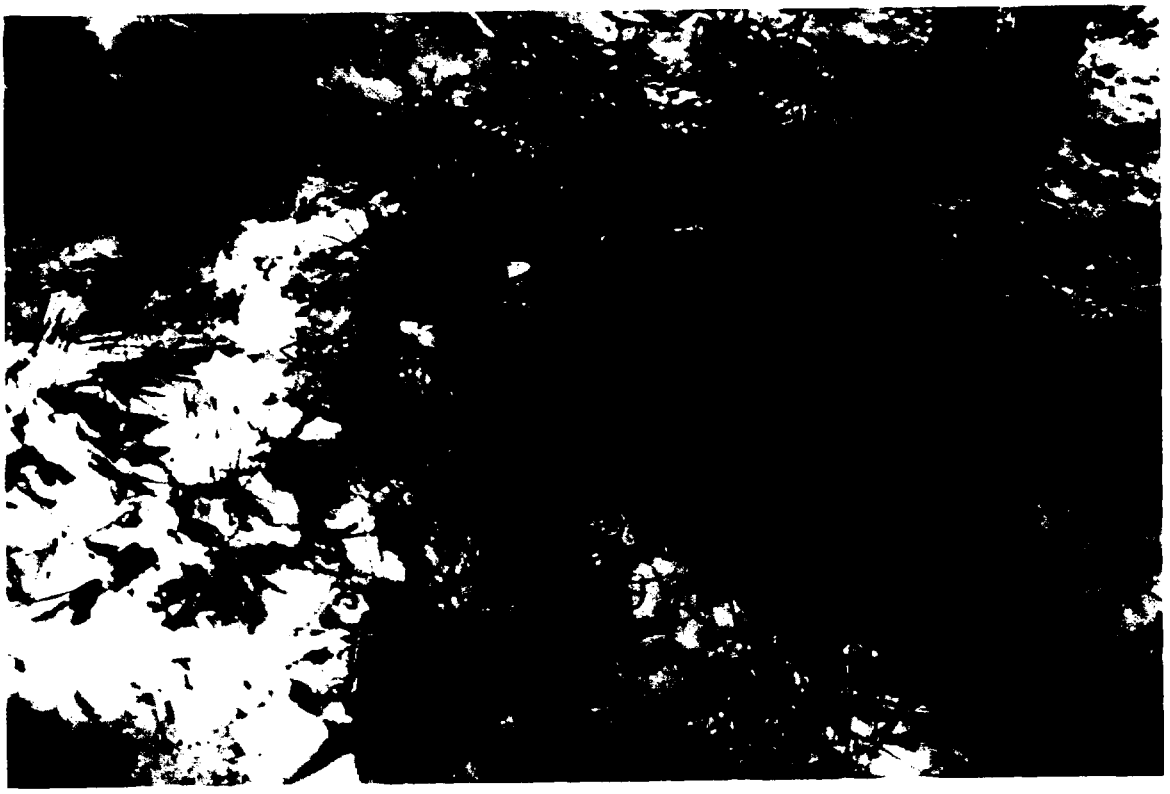
Photograph 10A - Settlement Monuments

Photograph 10B - Settlement Monuments



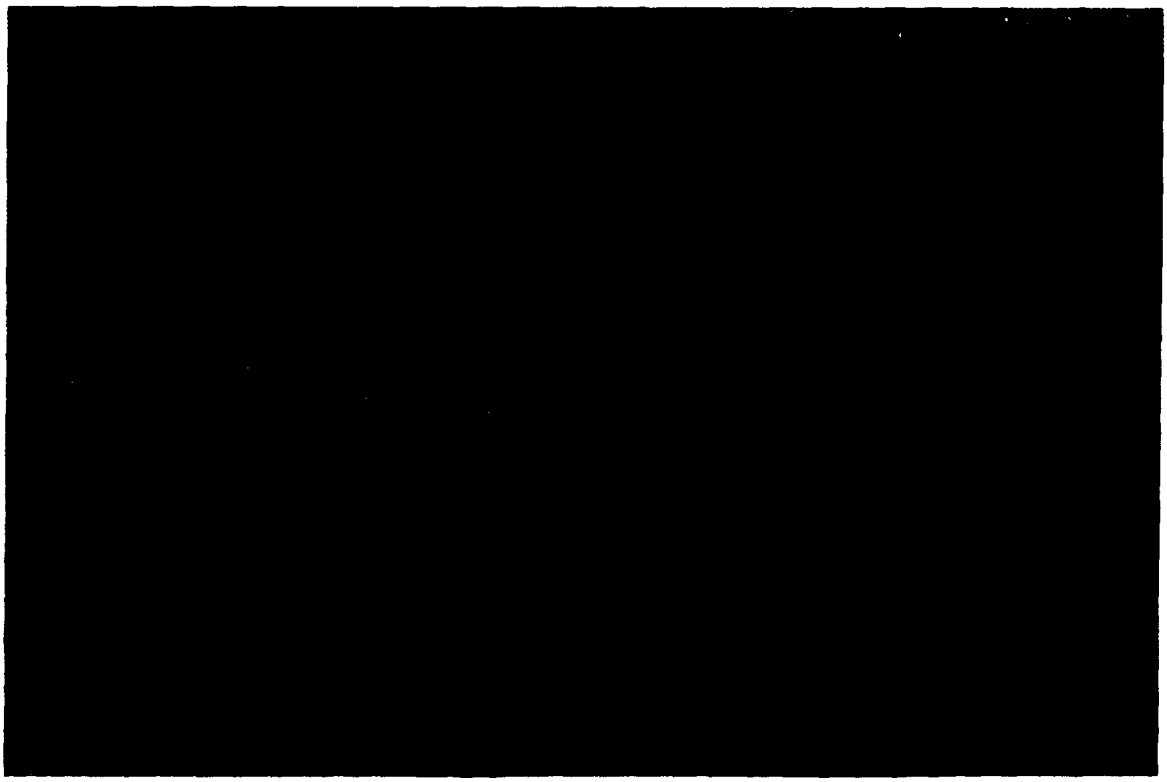
Photograph 11 - Ruts Along Clay Cap

Photograph 12 - Blocked Shale-Lined Drainage Ditch Across Clay Cap at the Top of the Rip-Rapped Slope



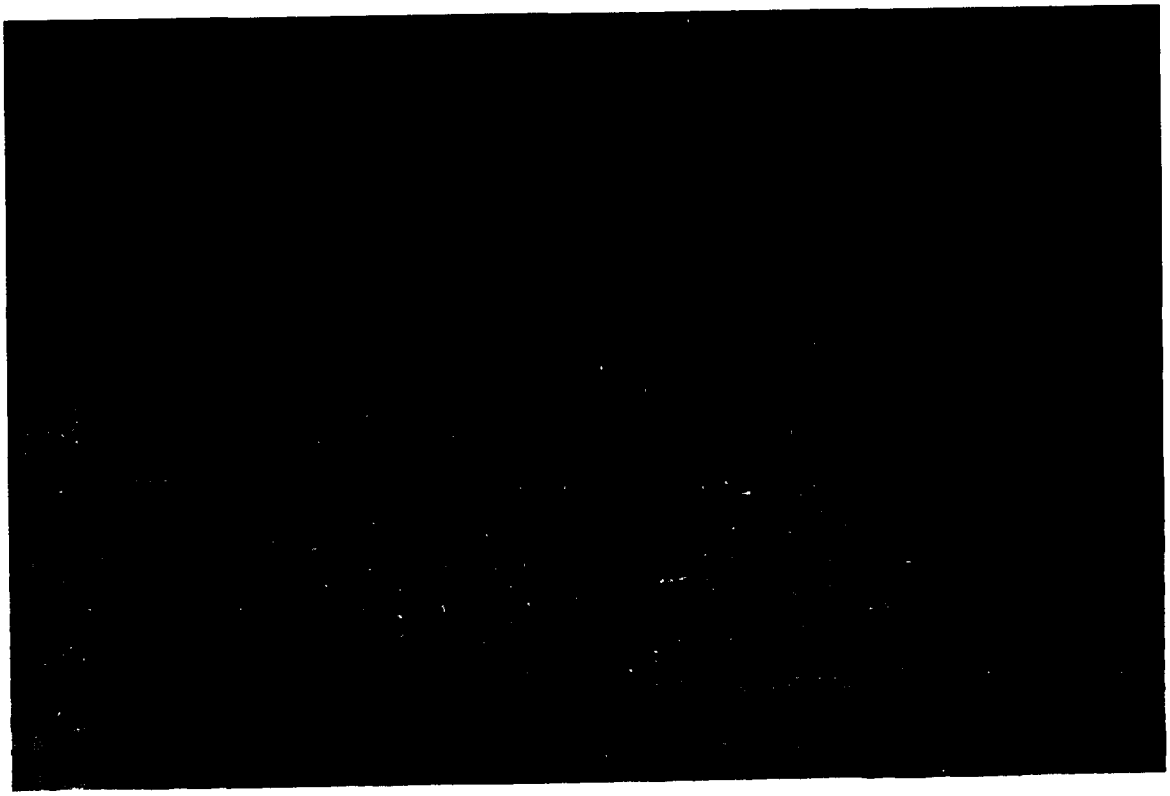
Photograph 13A - Sediment Build-up At Drainage Pipe and Ponded Water Upstream of Drainage Pipe Blockage

Photograph 13B - Sediment Build-up At Drainage Pipe and Ponded Water Upstream of Drainage Pipe Blockage

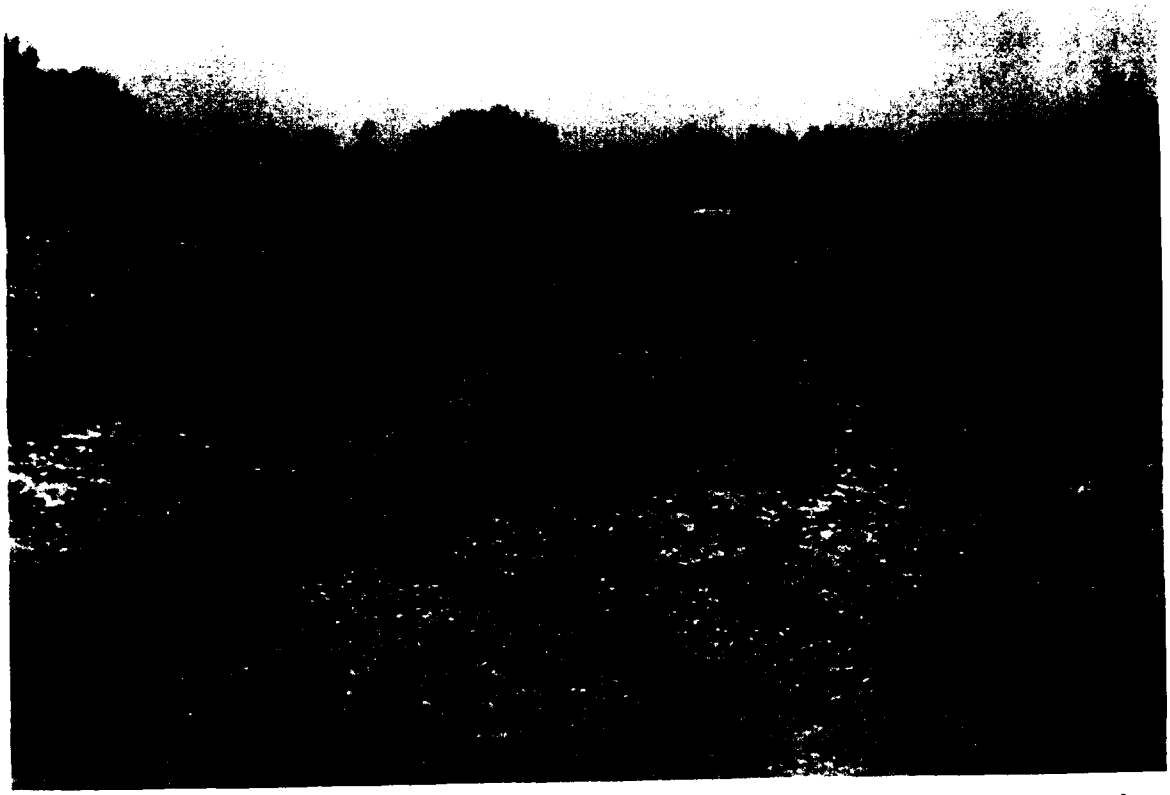


Photograph 14 - Access Road in South Tract

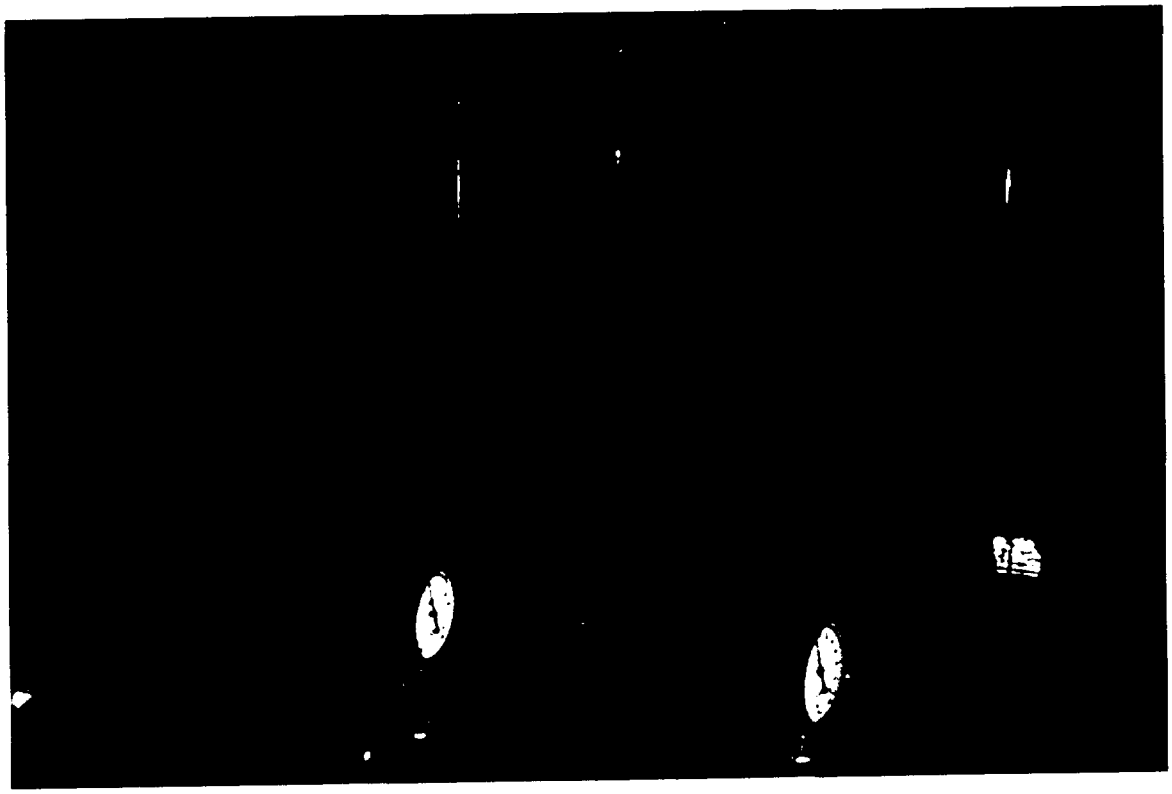
Photograph 15A - Debris and Hummocky Surface in South Tract



Photograph 15B - Debris and Hummocky Surface in South Tract



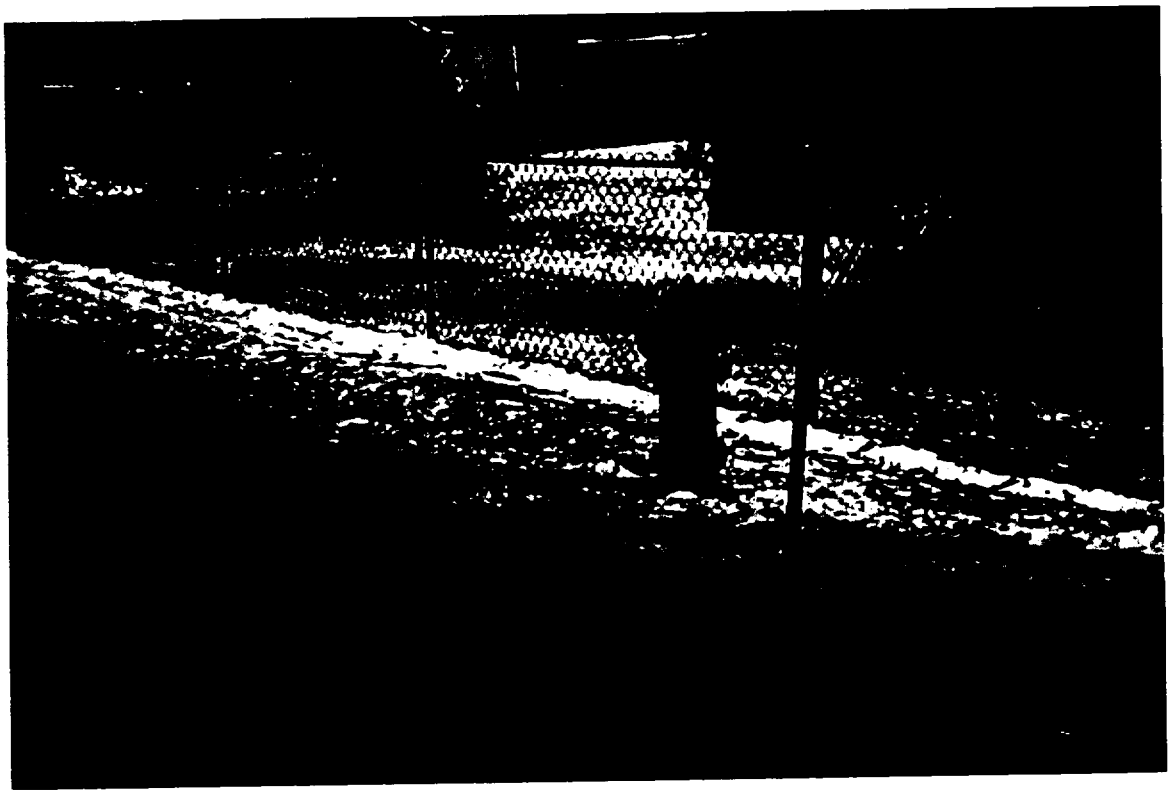
Photograph 16 - Ruts and Eroded Surface Due to Quad Runner Traffic; View from Putnam Road Looking South



Photograph 17 - Piping at the Subsurface Gas Collection Blower House

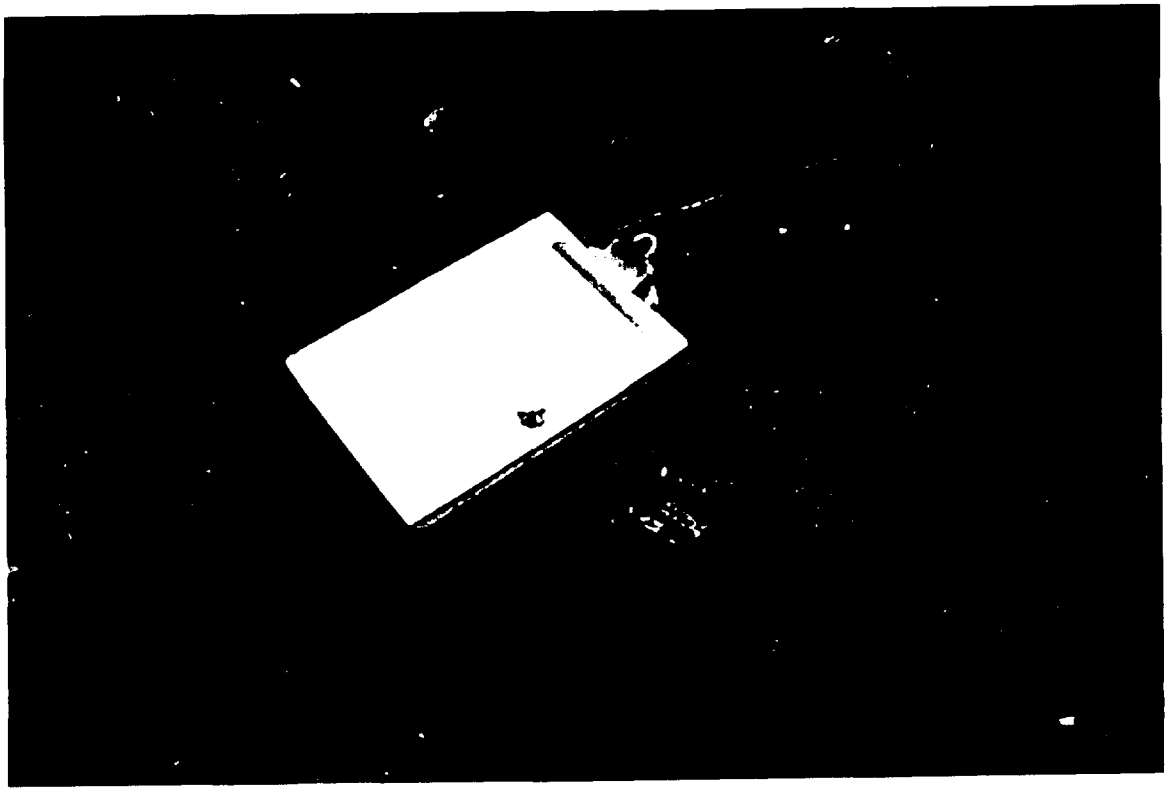
Photograph 18 - Barrier Across Putnam Road

Photograph 19A - Water Meter and Fireplug Along Putnam Road

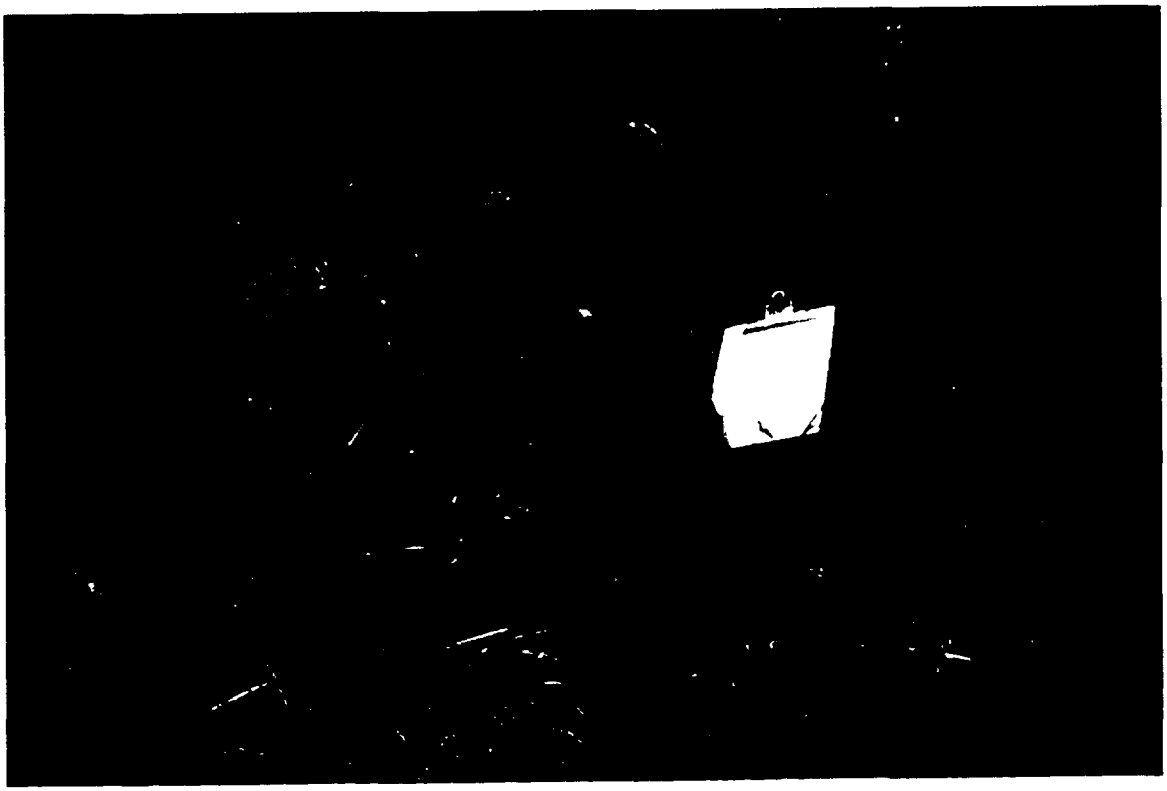


Photograph 19B - Water Meter and Fireplug Along Putnam Road

Photograph 20A – Elastic Material Observed at Surface



Photograph 20B – Elastic Material Observed at Surface



Photograph 21 – Buried Drum with Elastic Material

Attachment C

Forms

LEE'S LANE LANDFILL
LOUISVILLE, KY
3RD 5-YEAR REVIEW

February 25, 2003

NAME	AGENCY	TELEPHONE NUMBER	e-MAIL ADDRESS
JOHN [illegible]	CORPS ENGINEERS	502-315-6593	john.p.[illegible]@lrl02.usace.army.mil
Al Scalzo	" "	502-315-6329	albert.m.scalzo@lrl02.usace.army.mil
[illegible]	" "	502-315-[illegible]	m.t.pete[illegible].army.mil
[illegible]	DEP	502-564-[illegible]	[illegible]
Richard Watkins	MSD	502-540-[illegible]	watkins@msdlouky.org
FEMI AKINDELE	USEPA	404 562 8809	AKINDELE.FEMI@EPA.GOV

Form C-1
5-Year Review Site
Inspection Attendees

REPORT OF FIELD OBSERVATION
LEE'S LANE LANDFILL SITE, LOUISVILLE, KENTUCKY

Observation Report No: FY-03-3Q Date of Observation 02/25/03

Time Arrived Onsite: 11:20 AM Time Departed Site:12:30 PM

Field Personnel: MICHAEL HAGAN, UW III; RICHARD H WATKINS, SR SPECIAL ASST. TO DIR., JOHN JENT, U.S. ARMY COE, NAT PETERS, U.S. ARMY COE, M. FEMI AKINDELE, U.S. EPA, KEN LOGSDON KY. ENVIRONMENTAL PROTECTION CAB.

Section A:General Site Conditions

Observations:	Yes*	No	Not Observed	Comment No.
1. Major settlement of topsoil or erosion exposing waste/fill material	__	XX	__	____
2. Evidence of leachate seepage	__	XX	__	____
3. Distressed Vegetation	__	XX	__	____
4. Pot holes, erosion of access road	__	XX	__	A-4

Section B:Institutional Controls

Observations:	Yes*	No	Not Observed	Comment No.
1. Structural problem with Lee's Lane gate or barricade	__	XX	__	B-1
2. Structural problem with Putman Ave. barricade	__	XX	__	B-2
3. Lee's Lane gate unlocked	__	XX	__	____
4. Broken or missing lock	__	XX	__	____

Section C:Gas Collection System

Observations:	Yes*	No	Not Observed	Comme No.
1. Vandalism to blower house wells, or moisture traps	__	XX	__	____
2. Structural damage to blower house	__			
3. Blower not operating or visible damage	__			
4. Blower house not secure and unclean	__			

cview Site Inspection Checklist (MSD)

Form C-2
5-Year Review Site Inspection Checklist (from MSD)

Observations:	Yes*	No	Not Observed	Comment No.
5. Service box lids not in place	___	XX	___	___
6. Alarm and blower controls not functioning	___	XX	___	___
7. Settlement or tilting of well/moisture trap concrete collars	XX	___	___	C-7
8. Well/moisture trap covers missing or damaged	XX	___	___	C-8
9. Excessive vegetation covering wells/moisture traps	___	XX	___	___
10. Adjustment valve inaccessible	___	XX	___	___
11. Well/moisture trap caps, plugs, and piping missing	___	XX	___	___
12. Blower house and well/moisture trap signs missing or damaged	___	XX	___	___

Section D:Groundwater & Gas Monitor Wells

Observations:	Yes*	No	Not Observed	Comment No.
1. Wells unlocked	___	XX	___	___
2. Guard posts and rails missing or damaged	___	XX	___	___
3. Protective casing missing, damaged or rusted	XX	___	___	D-3
4. Concrete pads damaged or cracked	___	XX	___	___
5. Possible surface water infiltration into wells	___	XX	___	___
6. Excessive vegetation or debris around wells	___	XX	___	___
7. Well cap missing or damaged	___	XX	___	___
8. Tubing, fittings, and valves missing or damaged (gas wells only)	___	___	XX	D-8

Section E:Bank Protection Controls

Observations:	Yes*	No	Not Observed	Comment No.
1. Subsidence of slope, sloughing or caving	__	XX	__	____
2. Erosion of rip-rap or underlying material	__	XX	__	____
3. Abnormally damp areas, wet ground vegetation	__	XX	__	____
4. Soft spots in surface	__	XX	__	____
5. Seepage, water flow, piping, or sand boils	__	XX	__	____
6. Undermining of rip-rap	__	XX	__	____
7. Vegetative growth on rip-rap slope	XX	__	__	E-7
8. Buildup of trash and debris on rip-rap	__	XX	__	E-8
9. Exposed trash or filter fabric	__	XX	__	____
10. Tilting trees	__	XX	__	____
11. Tension cracks	__	XX	__	____
12. Survey monuments missing or damaged	__	XX	__	____

Section F:Surface Waste Cleanup/Cover

Observations:	Yes*	No	Not Observed	Comment No.
1. Swales greater than 1 foot wide and 2 inches deep	__	XX	__	____
2. Cracks greater than 1 inch wide and 6 inches deep	__	XX	__	____
3. Areas of erosional damage to grass	XX	__	__	F-3
4. Inadequate grass cover (area > 36 ft^2	XX	__	__	F-4
5. Ponded water (area larger than 2 feet in diameter and 3 inches deep)	XX	__	__	F-5
6. Erosion or ponded water greater than 12 inches deep (requires immediate repair)	__	XX	__	____

*If yes, assign a comment no. in the last column and follow instructions on comment sheet.

REPORT OF FIELD OBSERVATION
LEE'S LANE LANDFILL SITE, LOUISVILLE, KENTUCKY

Observation Report No: FY-03-2Q Date of Observation 12/17/02

Site Map

Observer's Signature: _____

Date: _____

0

REPORT OF FIELD OBSERVATION
LEE'S LANE LANDFILL SITE, LOUISVILLE, KENTUCKY

Observation Report No.: FY03-3Q **Date of Observation: 02/25/03**

Instruction: If any item is checked yes, provide details of the problem and maintenance recommendations below and indicate the location of deficiency on the site map provided.

Comment No.:	Comment
A-4	Small amount of rutting was observed on the gravel road leading to gas collection Well No. 5 from ATVs.
B-1	Condition of the Lee's Lane barricade remains unchanged from previous quarterly institutional inspections.
B-2	Condition of the Putnam Avenue barricade remains unchanged from previous quarterly institutional inspections. Intrusions into the landfill site and flood protection levee areas by ATVs from the woods adjacent to the Putnam Avenue barricade has been reduced, but is still evident. The landfill site and flood protection levee continues to receive surveillance by the Jefferson County Police.

Comment No.	Corrective Action Performed
A-4	Schedule gravelling of the access road leading to Well No. 5 to fill rutted areas during FY03-4Q as weather and scheduling permit.
B-1	Continue to observe condition of the Lee's Lane barricade during future quarterly institutional inspections. Schedule painting of Lee's Lane barricade during FY03-4Q.

B-2	Continue to observe condition of the Putnam Avenue barricade during future quarterly institutional inspections. Replace damaged "No Trespass – Keep Out" signs at strategic locations along the access roads and Mill Creek cut-off channel areas in an effort to discourage ATV intrusions and trespass into the landfill and levee area sites. Schedule painting of Putnam barricade by end of FY03-4Q.

Comment No.:	Comment
C-7	Observed tilted well and moisture trap concrete collars for 2, 4, 8, 11, 12, 14, and 16
C-8	Observed covers missing for moisture traps 25, 26, and 27.
D-3	Observed protective casing of gas monitoring wells rusting.

Comment No.	Corrective Action Performed
C-7	Schedule resetting of tilted well and moisture trap concrete collars for moisture traps 2, 4, 8, 11, 12, 14 and 16 weather and scheduling permitting.
C-8	Obtain replacement covers and install on moisture traps
D-3	Schedule painting of gas monitoring wells protective casings during FY03-4Q.

Comment No.:	Comment
D-8	Monitoring wells tubing, fittings, and valves were not directly observed but no external damage or disturbance to enclosures was evident.
E-7	Observed vegetative growth on portions of the riprap levee and riprap drainage channel slopes.
E-8	Observed small amount of trash and debris build-up on the riprap area from prior observations. Trespassers continue to utilize the debris as fuel for small bonfires, thereby eliminating the necessity to remove the debris from the riprap area. Also observed automobile hood that has been dump in scale.
F-3	Observed areas erosional damage to grass caused by off road vehicles
F-4	Observed areas of inadequate grass cover from intrusion of ATVs.
F-5	Observed area of ponding water from intrusion of off road vehicles creating several ruts and low areas.

Comment No.	Corrective Action Performed
D-8	Monitoring well tubing, fittings, and valves were not directly observed but no external damage or disturbance to enclosures was evident.
E-7	Spraying of the riprap drainage channels and riprap cap area should be scheduled during FY03-4Q.
E-8	Schedule removal of large debris and automobile hood and monitor for additional debris.
F-3	Monitor and schedule restoration of eroded areas as required as weather and staffing permit.
F-4	Monitored at future quarterly institutional inspections backfill and seed areas as necessary.
F-5	Condition of ruts left by ATVs and other vehicles should be monitored at future quarterly institutional inspections and scheduled backfilling as necessary. Also schedule redevelopment f drainage swales as needed during FY03-4Q as weather and staffing permit.

Form C-3 Groundwater Monitoring Data

GW MW-A

Parameter Detected	Maximum Contaminant Level (mg/L)	Sample Data								Sample Data								Sample Date					
		7/88	10/88	3/89	6/89	10/19/92	2/23/1993	5/25/1993	8/24/1993	11/16/1993	6/8/1994	9/13/1994	11/22/1994	3/22/1995	9/30/1995	12/14/1995	5/22/1996	12/12/1996	11/9/1999	9/27/2000	9/13/2001	9/25/2002
Units		(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)
Chromium	0.1	0.029	ND	0.013	ND	0.12	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	< 0.010	< 0.01	0.032	0.064
Iron	0.3 SMCL	51	1.3 J	3.0	0.31	3.9	0.45	0.5	0.42	0.7	0.49	0.52	0.57	0.66	1.3	0.44	0.57	0.52	0.32	0.066	1.4	0.66
Manganese	0.05 SMCL	4.1	0.12	0.27	0.071	0.38	0.052	ND	ND	0.075	ND	ND	0.032	ND	0.059	ND	ND	ND	0.026	< 0.01	0.089	0.025
Lead	0.015	0.045	ND	ND	NC	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	< 0.0050	< 0.005	<0.005	<0.005
Antimony	0.006	NA	NA	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	< 0.030	< 0.010	<0.010	<0.010
Cadmium	0.005	0.015	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	100	< 0.005	<0.005	<0.005
Arsenic	0.05	0.003	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	< 0.0050	< 0.005	< 0.005	< 0.005
1,2-Dichloroethane	0.005	NA	NA	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		<0.005	<0.005	<0.005
Trichloroethane	0.005	NA	NA	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		<0.005	<0.005	<0.005
Bis(2-ethlyhexyl)phthalate	0.006	NA	NA	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		<0.010	<0.010	<0.010

SMCL = Secondary Maximum Contaminant Level
NA = Not Analyzed
ND = Compound not detected

GW MW-B

Parameter Detected	Maximum Contaminant Level (mg/L)	Sample Date								Sample Date								Sample Date					
		7/88	10/88	3/89	6/89	10/19/92	2/23/1993	5/25/1993	8/24/1993	11/16/1993	3/16/1994	6/8/1994	9/13/1994	11/22/1994	3/22/1995	6/28/1995	9/30/1995	12/14/1995	5/22/1996	3/6/1996	12/12/1996	9/27/2000	9/13/2001	9/25/2002
Units		(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)
Chromium	0.1	0.023	ND	ND	ND	NC	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	< 0.01	0.014	0.21
Iron	0.3 SMCL	10	0.5 J	0.9	0.3	1.1	0.55	0.6	0.34	0.6	4.5	1	1	0.64	0.61	1.4	0.7	0.15	0.94	0.39	0.4	0.23	2.2	3.8
Manganese	0.05 SMCL	1	0.3	0.63	0.22	0.76	0.48	ND	0.37	0.41	1.2	0.52	0.45	0.31	0.3	0.5	0.36	0.27	0.16	0.18	0.21	0.3	0.25	0.33
Lead	0.015	0.018	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.038	ND	ND	ND	ND	< 0.005	<0.005	<0.005
Antimony	0.006	NA	NA	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	< 0.010	<0.010	<0.010
Cadmium	0.005	NA	NA	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	< 0.005	<0.005	<0.005
Arsenic	0.05	NA	NA	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	< 0.005	< 0.005	< 0.005
1,2-Dichloroethane	0.005	NA	NA	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	<0.005	<0.005	<0.005
Trichloroethane	0.005	NA	NA	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	<0.005	<0.005	<0.005
Bis(2-ethlyhexyl)phthalate	0.006	NA	NA	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND					<0.010	<0.010	<0.010

SMCL = Secondary Maximum Contaminant Level
NA = Not Analyzed
ND = Compound not detected

GW MW-07

Parameter Detected	Maximum Contaminant Level (mg/L)	Sample Date								Sample Date								Sample Date					
		7/88	10/88	3/89	6/89	10/19/1992	2/23/1993	5/25/1993	8/24/1993	11/16/1993	3/16/1994	6/8/1994	9/13/1994	11/22/1994	3/22/1995	6/28/1995	12/14/1995	5/22/1996	3/6/1996	12/12/1996	9/27/2000	9/13/2001	9/25/2002
Units		(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)
Chromium	0.1	ND	0.089 J	0.026	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	< 0.01	<0.010	<0.010
Iron	0.3 SMCL	0.95	1.1 J	2.3	0.32	2.8	3.0	2.9	3.0	2.8	3.2	2.9	3.1	3.4	3.5	3	2.8	3.6	3.5	4.2	4.1	4.3	4.6
Manganese	0.05 SMCL	0.15	0.067	0.16	0.11	0.11	0.12	0.11	0.13	0.11	0.1	0.12	0.11	0.13	0.13	0.11	0.12	0.13	0.15	ND	0.19	0.19	0.21
Lead	0.015	0.015	0.012	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.015	ND	ND	<0.005	<0.005	<0.005
Antimony	0.006	NA	NA	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	< 0.010	<0.010	<0.010
Cadmium	0.005	NA	NA	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	< 0.005	<0.005	<0.005
Arsenic	0.05	NA	NA	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	< 0.005	< 0.005	< 0.005
1,2-Dichloroethane	0.005	NA	NA	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	<0.005	<0.005	<0.005
Trichloroethane	0.005	NA	NA	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	<0.005	<0.005	<0.005
Bis(2-ethlyhexyl)phthalate	0.006	NA	NA	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND					<0.010	<0.010	<0.010

SMCL = Secondary Maximum Contaminant Level
NA = Not Analyzed
ND = Compound not detected

GW MW-04

Parameter Detected	Alternate Concentration Limit (mg/L) revised 2003*	Sample Date								Sample Date								Sample Date					
		7/88	10/88	3/89	6/89	10/19/1992	2/23/1993	5/25/1993	8/24/1993	11/16/1993	3/16/1994	6/8/1994	9/13/1994	11/22/1994	3/22/1995	6/28/1995	9/30/1995	12/14/1995	5/22/1996	3/6/1996	12/12/1996	9/27/2000	9/13/2001	9/25/2002
Units		(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)
Chromium	55	0.009	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NC	ND	ND	ND	ND	ND	ND	< 0.01	<0.010	<0.010
Iron	1100	0.61	3.7 J	9.3	8.7	5.9	7.2	6.3	6	5.8	7	6.4	6.5	6.2	6.3	5.9	6	5.7	7.2	8.6	6.3	5.5	8.2	6.4
Manganese	55	ND	0.15	0.33	0.27	0.18	0.17	ND	0.16	0.15	0.16	0.16	0.15	0.16	0.15	0.14	0.15	0.13	0.16	0.2	0.16	0.14	0.14	0.15
Lead	55	0.029	0.023	ND	0.007	ND	0.028	ND	ND	ND	0.12	ND	0.035	0.021	ND	ND	0.016	ND	0.019	0.039	ND	0.0068	0.0068	<0.005
Antimony	(0.006)	NA	NA	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	< 0.010	<0.010	<0.010
Cadmium	13.2	NA	NA	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	< 0.005	<0.005	<0.005
Arsenic	55	NA	NA	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.012	0.011	0.0061
1,2-Dichloroethane	(0.005)	NA	NA	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	<0.005	<0.005	<0.005
Trichloroethane	(0.005)	NA	NA	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	<0.005	<0.005	<0.005
Bis(2-ethlyhexyl)phthalate	(0.006)	ND	ND	ND	0.056	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND						<0.010	<0.010	<0.010

NA = Not Analyzed
ND = Compound not detected
( ) = Maximum Contaminant Level (MCL)
* Based on 11,000 cfs Ohio River flow

GW MW-05

Parameter Detected	Alternate Concentration Limit (mg/L) revised 2003*	Sample Date								Sample Date								Sample Date					
		7/88	10/88	3/89	6/89	10/19/1992	2/23/1993	5/25/1993	8/24/1993	11/16/1993	3/16/1994	6/8/1994	9/13/1994	11/22/1994	3/22/1995	6/28/1995	9/30/1995	12/14/1995	5/22/1996	3/6/1996	12/12/1996	9/27/2000	9/13/2001	9/25/2002
Units		(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)
Chromium	55	NA	0.083 J	0.008	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	< 0.01	0.026	<0.010
Iron	1100	NA	17 J	7.7	12	110	41	130	ND	55	21	110	140	120	14	110	70	240	48	46	17	14	ND	28
Manganese	55	NA	2.3	1.4	0.75	0.98	0.72	1.1	ND	0.82	0.58	1.1	1	1.2	1.1	1.2	0.97	1.3	0.76	0.71	ND	0.92	ND	0.01
Lead	55	NA	ND	25	3.7	1.3	0.43	0.72	0.99	0.39	0.09	0.62	0.24	0.3	0.06	0.21	0.23	0.32	0.08	0.52	0.14	< 0.005	<0.005	0.088
Antimony	(0.006)	NA	ND	0.58	0.082	8.036	ND	ND	ND	0.843	ND	ND	0.042	0.043	ND	ND	ND	ND	ND	ND	ND	< 0.030	<0.010	<0.010
Cadmium	13.2	NA	NA	NA	NA	0.0092	0.0053	ND	ND	ND	ND	ND	0.0053	0.005	ND	ND	0.0054	ND	ND	ND	ND	< 0.005	<0.005	<0.005
Arsenic	55	NA	ND	0.017 J	0.01 J	0.8	0.3	ND	2.6	0.36	0.12	0.38	0.72	0.85	ND	0.55	0.53	1.6	0.3	0.26	0.07	0.029	<0.005	0.1
1,2-Dichloroethane	(0.005)	NA	NA	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	<0.005	<0.005	<0.005

Form C-4 Gas Monitoring Wells

G-1:

Compound	25% LEL (%)	25% LEL (ppbv)	Sample Date																							
		Units:	07/88 ppbv	11/88 ppbv	03/89 ppbv	07/89 ppbv	11/92 ppbv	2/93 ppbv	5/93 ppbv	8/93 ppbv	11/93 ppbv	3/94 ppbv	6/94 ppbv	9/94 ppbv	11/94 ppbv	3/95 ppbv	6/95 ppbv	9/95 ppbv	12/95 ppbv	3/96 ppbv	5/96 ppbv	9/96 ppbv	06/97 ppbv	09/97 ppbv	04/98 ppbv	09/99 ppbv	04/01 ppbv
Benzene	0.325	3,250,000					0.26	0.24	0.85	0.5	0.26	0.5	0.5	1.03	0.17	0.21	0.21	1.66	0.5	0.06	0.15	0.06	0.85	VOID	6.95	23.7	0.66
Toluene	0.3	3,000,000					0.47	0.14	0.85	0.5	2.3	0.52	5.73	3.71	0.21	0.58	1.72	10.25	2.22	0.2	0.47	0.25	4.82	VOID	10.2	154	4.36
Xylene (total)	0.275	2,750,000					0.45	0.13	0.85	0.5	0.75	0.5	1.61	1.43	0.16	0.36	0.76	6.2	1.2	0.06	0.76	0.07	3.45	VOID	1.11	3.09	0.527
Methylene Chloride	3.5	35,000,000					ND	0.68	0.85	0.5	0.3	0.5	0.5	0.11	0.07	0.25	0.54	0.49	0.01	0.01	0.1	0.01	4.02	VOID	2.77	0.58	9.91
Vinyl Chloride	0.9	9,000,000					ND	ND	0.85	0.5	0.3	0.5	0.5	0.5	0.5	0.01	0.01	0.01	0.01	0.01	0.01	ND	1.19	VOID	6.69	11.8	ND
Methane	1.25	12,500,000	4.2	2,760	**	ND	ND	4.8	2.08	1.7	2.13	3.52	1052	3.11	3.28	2.82	2.85	2.72	4.05	51.84	ND	1.8	1,580,000	VOID	2,130,000	11,700	14,900

ND = Not Detected
** = Invalid

G-2:

Compound	25% LEL (%)	25% LEL (ppbv)	Sample Date																							
		Units:	07/88 ppbv	11/88 ppbv	03/89 ppbv	07/89 ppbv	11/92 ppbv	2/93 ppbv	5/93 ppbv	8/93 ppbv	11/93 ppbv	3/94 ppbv	6/94 ppbv	9/94 ppbv	11/94 ppbv	3/95 ppbv	6/95 ppbv	9/95 ppbv	12/95 ppbv	3/96 ppbv	5/96 ppbv	9/96 ppbv	06/97 ppbv	09/97 ppbv	04/98 ppbv	09/99 ppbv	04/01 ppbv
Benzene	0.325	3,250,000					0.19	0.05	0.8	0.5	0.11	0.5	0.5	0.15	0.21	0.09	0.13	0.08	0.09	0.05	0.12	0.13	0.38	VOID	0.24	0.06	0.044
Toluene	0.3	3,000,000					0.26	0.03	1	0.5	0.23	0.5	1.06	0.89	0.24	0.34	0.58	0.53	0.32	0.19	0.43	0.55	1.68	VOID	0.48	0.22	0.461
Xylene (total)	0.275	2,750,000					0.28	0.06	0.8	0.5	0.2	0.5	0.5	0.26	0.22	0.17	0.45	0.28	0.19	0.01	0.39	0.13	2.51	VOID	0.19	0.14	0.07
Methylene Chloride	3.5	35,000,000					ND	0.29	0.8	0.5	0.3	0.5	0.5	0.5	0.06	1.99	0.05	0.01	0.01	0.01	0.88	0.06	1.47	VOID	0.36	0.12	0.115
Vinyl Chloride	0.9	9,000,000					ND	ND	0.8	0.5	0.5	0.5	0.5	0.5	0.5	0.01	0.01	0.01	0.01	0.01	0.01	ND	12.8	VOID	0.04	0.25	ND
Methane	1.25	12,500,000	1.8	121,000	**	ND	ND	3.6	2.06	0.05	0.75	3.07	0.89	3.63	3.46	1.11	2.94	0.9	1.73	2.62	5.56	0.87	4980	VOID	1200000	16200	11900

ND = Not Detected
** = Invalid

G-3:

Compound	25% LEL (%)	25% LEL (ppbv)	Sample Date																							
		Units:	07/88 ppbv	11/88 ppbv	03/89 ppbv	07/89 ppbv	11/92 ppbv	2/93 ppbv	5/93 ppbv	8/93 ppbv	11/93 ppbv	3/94 ppbv	6/94 ppbv	9/94 ppbv	11/94 ppbv	3/95 ppbv	6/95 ppbv	9/95 ppbv	12/95 ppbv	3/96 ppbv	5/96 ppbv	9/96 ppbv	06/97 ppbv	09/97 ppbv	04/98 ppbv	09/99 ppbv	04/01 ppbv
Benzene	0.325	3,250,000					0.19	0.26	0.75	0.5	0.12	0.5	0.5	0.15	0.06	0.15	0.1	0.51	0.1	0.07	0.09	0.12	0.17	0.62	0.92	0.24	0.266
Toluene	0.3	3,000,000					0.29	0.16	0.75	0.5	0.27	0.5	0.5	0.91	0.09	0.24	0.42	4.27	0.36	0.34	0.34	0.33	0.68	4.91	1.89	0.72	1.88
Xylene (total)	0.275	2,750,000					0.76	0.11	0.75	0.5	0.2	0.5	0.5	0.29	0.11	0.23	0.31	1.25	0.21	0.08	0.23	0.13	0.46	1.45	1.52	0.08	0.291
Methylene Chloride	3.5	35,000,000					ND	0.32	0.75	0.5	0.3	0.5	0.5	0.5	0.02	0.83	0.05	0.19	0.01	0.01	0.46	0.05	0.76	0.41	4.73	0.18	0.162
Vinyl Chloride	0.9	9,000,000					ND	ND	0.75	0.5	0.5	0.5	0.5	0.5	0.5	0.01	0.01	0.01	0.01	0.01	0.01	ND	0.01	0.22	ND	ND	ND
Methane	1.25	12,500,000	9.4	3,820	**	ND	ND	4.3	0.84	1.4	0.88	2.1	0.86	3.73	2.36	2.49	2.9	3.88	2.37	1.94	4.24	0.89	5030	2670	1230	17200	17900

ND = Not Detected
** = Invalid

G-4:

Compound	25% LEL (%)	25% LEL (ppbv)	Sample Date																							
		Units:	7/88 ppbv	10/88 ppbv	3/89 ppbv	7/89 ppbv	11/92 ppbv	2/93 ppbv	5/93 ppbv	8/93 ppbv	11/93 ppbv	3/94 ppbv	6/94 ppbv	9/94 ppbv	11/94 ppbv	3/95 ppbv	6/95 ppbv	9/95 ppbv	12/95 ppbv	3/96 ppbv	5/96 ppbv	9/96 ppbv	06/97 ppbv	09/97 ppbv	04/98 ppbv	09/99 ppbv	04/01 ppbv
Benzene	0.325	3,250,000					0	0	1	1	0	1	0.63	0.61	0.91	0.18	NA	0.51	0.66	0.01	0.05	0.13	0.26	0.37	0.59	ND	36.2
Toluene	0.3	3,000,000					0	0	1	1	5	2	7.24	2.47	3.54	2.21	NA	4.6	2.45	0.23	0.28	0.42	4.27	8.11	0.99	0.15	0.721
Xylene (total)	0.275	2,750,000					0	0	1	1	1	1	2.15	1.2	4.8	0.57	NA	1.35	1.16	0.08	0.21	0.16	0.74	0.83	0.95	0.08	8.07
Methylene Chloride	3.5	35,000,000					ND	1	1	1	0	1	1.76	0.5	0.33	1.48	NA	0.2	0.18	0.01	0.65	0.05	1.25	0.48	0.14	0.13	0.655
Vinyl Chloride	0.9	9,000,000					ND	ND	1	1	1	1	0.6	0.5	0.5	0.01	NA	0.01	0.01	0.01	0.01	ND	0.01	0.25	ND	ND	12.5
Methane	1.25	12,500,000	2.3	4,980	**	ND	ND	7	2	1	1	2	2.52	3.39	2.9	2.82	NA	3.24	4.25	1.92	3.08	0.88	4,810	3,260	1,770	16,900	5,400

ND = Not Detected
** = Invalid

G-5:

Compound	25% LEL (%)	25% LEL (ppbv)	Sample Date																													
		Units:	7/88 ppbv	10/88 ppbv	3/89 ppbv	7/89 ppbv	11/92 ppbv	2/93 ppbv	5/93 ppbv	8/93 ppbv	11/93 ppbv	3/94 ppbv	6/94 ppbv	9/94 ppbv	11/94 ppbv	3/95 ppbv	6/95 ppbv	9/95 ppbv	12/95 ppbv	3/96 ppbv	5/96 ppbv	9/96 ppbv	06/97 G5-L ppbv	06/97 G5-R ppbv	09/97 G5-L ppbv	09/97 G5-R ppbv	04/98 G5-L ppbv	04/98 G5-R ppbv	09/99 G5-L ppbv	09/99 G5-R ppbv	04/01 G5-L ppbv	04/01 G5-R ppbv
Benzene	0.325	3,250,000					0.28	0.05	0.7	0.5	0.33	0.5	0.5	0.29	0.18	0.21	0.12	0.71	0.11	0.03	0.25	0.24	0.4	0.05	0.13	0.1	0.26	0.22	0.1	0.03	0.133	0.309
Toluene	0.3	3,000,000					2.49	0.04	0.7	0.5	0.81	0.5	2.85	0.78	0.27	0.76	0.57	2.78	0.39	0.41	1.52	0.58	2.68	0.51	2.07	1.13	0.83	0.75	0.27	0.17	0.769	2.82
Xylene (total)	0.275	2,750,000					0.58	0.03	0.7	0.54	0.43	0.5	0.74	0.29	0.23	0.31	0.32	2.06	0.31	0.01	0.74	0.2	0.89	0.27	0.73	0.58	0.29	0.21	0.09	0.06	0.168	0.277
Methylene Chloride	3.5	35,000,000					ND	1.1	0.7	0.5	0.3	0.5	0.5	0.5	0.06	0.3	0.05	0.1	0.01	0.301	0.84	0.06	0.92	0.26	1.3	0.85	0.16	0.18	0.11	0.12	0.232	0.138
Vinyl Chloride	0.9	9,000,000					ND	ND	0.7	0.5	0.5	0.5	0.5	0.5	0.5	0.01	0.01	0.01	0.01	0.01	0.01	0.47	0.05	0.01	0.17	ND	ND	ND	0.68	ND	0.222	ND
Methane	1.25	12,500,000	0	2,370	**	ND	ND	5.00	1.24	0.92	2.26	2.2	2.1	1.29	2.94	2.46	3.99	2.39	1.87	1.89	3.36	0.82	4600	2850	1,740	1,110	160	580	12,100	15,500	15,000	14,900

ND = Not Detected
** = Invalid

Gas samples analyzed by EPA Compendium Method TO-15 using Gas Chromatography/Mass Spectrometry
Values of "non-detect are not available

Form C-5 Ambient Air Sampling

Ambient Air Sample R1

Compound	25% LEL (%)	25% LEL (ppbv)	Sample Date																					
			11/92	2/93	5/93	8/93	11/93	3/94	6/94	9/94	11/94	3/95	6/95	9/95	12/95	3/96	5/96	9/96	6/97	9/97	5/98	9/99	4/01
		Units:	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv
Benzene	0.325	3,250,000		0.24	<.80	<0.50	0.34	<.50	0.57	0.17	0.18	0.22	0.08	0.37	0.79	0.29	0.22	0.15	1.24	0.41	0.53	0.36	0.610
Toluene	0.3	3,000,000		0.17	<.80	<0.50	1.05	<.50	3.15	1.35	0.21	1.29	0.23	2.81	3.31	0.66	0.49	0.21	22.80	3.19	0.59	2.11	3.85
Xylene (total)	0.275	2,750,000		0.12	<.80	<0.50	0.57	<.50	1.13	0.48	0.16	0.39	0.13	0.98	1.33	0.44	0.43	0.10	3.48	0.70	0.48	0.66	0.889
Methylene Chloride	3.5	35,000,000		0.65	1.1	<0.50	1.94	2.42	19.13	6.91	1.28	2.71	5.53	9.42	0.44	0.30	0.46	0.30	11.10	34.90	1.33	3.31	0.583
Vinyl Chloride	0.9	9,000,000		ND	<.80	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.01	<0.01	<0.01	0.13	<0.01	<0.01	ND	<0.01	0.06	ND	ND	ND
Methane	1.25	12,500,000		ND	1.68	2.16	2.35	2.05	2.63	3.87	3.11	2.41	3.29	2.54	4.16	3.06	3.50	1.04	4,800.00	3,290.00	1,710.00	16,500.00	15,900.00

ND = Not Detected

Ambient Air Sample R2

Compound	25% LEL (%)	25% LEL (ppbv)	Sample Date																					
			11/92	2/93	5/93	8/93	11/93	3/94	6/94	9/94	11/94	3/95	6/95	9/95	12/95	3/96	5/96	9/96	6/97	9/97	5/98	9/99	4/01
		Units:	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv
Benzene	0.325	3,250,000		0.36	<0.75	<0.50	0.54	<0.50	0.52	0.22	0.57	0.21	0.12	0.50	0.68	0.19	0.21	0.15	0.65	0.35	0.58	0.50	0.601
Toluene	0.3	3,000,000		0.17	<0.75	<0.50	4.07	0.87	4.79	1.21	1.79	1.51	0.36	3.49	3.32	0.45	0.64	0.24	1.15	2.36	0.64	2.06	3.23
Xylene (total)	0.275	2,750,000		0.61	<0.75	<0.50	1.54	<0.50	1.48	0.61	2.09	0.42	0.19	1.44	1.37	0.45	0.29	0.11	0.66	1.11	0.51	0.89	0.766
Methylene Chloride	3.5	35,000,000		3.49	3.10	<0.50	<0.30	6.53	1.81	0.53	0.57	0.37	0.52	0.60	0.65	<0.01	0.56	0.08	0.62	3.90	2.66	13.70	0.683
Vinyl Chloride	0.9	9,000,000		ND	<0.75	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.05	ND	ND	ND
Methane	1.25	12,500,000		1.80	2.07	1.57	1.99	2.22	2.32	3.90	3.41	2.49	2.94	2.45	4.51	3.33	3.68	0.90	820.00	3,540.00	2,040.00	13,700.00	14,600.00

ND = Not Detected

Ambient Air Sample U1

Compound	25% LEL (%)	25% LEL (ppbv)	Sample Date																					
			11/92	2/93	5/93	8/93	11/93	3/94	6/94	9/94	11/94	3/95	6/95	9/95	12/95	3/96	5/96	9/96	6/97	9/97	5/98	9/99	4/01
		Units:	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv
Benzene	0.325	3,250,000		0.23	<0.80	0.62	0.36	<0.50	<0.50	0.14	0.20	0.18	0.10	0.31	0.54	0.09	0.15	0.18	7.02	0.80	0.67	0.23	0.558
Toluene	0.3	3,000,000		0.15	<0.80	<0.50	1.09	<0.50	2.15	0.74	0.21	1.15	0.55	2.23	2.83	0.30	0.43	0.31	11.30	3.00	1.36	0.55	4.38
Xylene (total)	0.275	2,750,000		0.09	<0.80	<0.50	0.71	<0.50	0.79	0.22	0.23	0.25	0.14	1.00	1.21	0.15	0.25	0.15	10.54	1.26	1.02	0.42	0.859
Methylene Chloride	3.5	35,000,000		0.53	<0.80	11.00	<0.30	1.01	14.53	0.74	0.11	0.20	0.66	0.89	0.78	<0.01	0.51	0.21	0.86	15.20	1.82	0.32	0.574
Vinyl Chloride	0.9	9,000,000		ND	<0.80	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.03	<0.01	ND	ND	ND	ND
Methane	1.25	12,500,000		0.70	1.66	2.29	2.75	2.04	2.27	3.63	2.77	2.51	3.05	2.29	4.47	2.95	3.40	0.89	750.00	4.17	1,680.00	20,600.00	23,300.00

ND = Not Detected

Ambient Air Sample A2

Compound	25% LEL (%)	25% LEL (ppbv)	Sample Date																					
			11/92	2/93	5/93	8/93	11/93	3/94	6/94	9/94	11/94	3/95	6/95	9/95	12/95	3/96	5/96	9/96	6/97	9/97	5/98	9/99	4/01
		Units:	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv
Benzene	0.325	3,250,000	0.29	0.21	<0.80	0.60	0.39	<0.50	<0.50	0.21	0.18	0.22	0.12	0.55	0.65	0.09	0.20	0.13	0.55	0.66	0.65	0.31	0.499
Toluene	0.3	3,000,000	0.56	0.15	0.91	<0.50	1.09	<0.50	1.95	1.57	0.17	0.58	0.32	6.08	2.61	0.23	0.64	0.17	5.90	8.36	0.97	1.96	3.28
Xylene (total)	0.275	2,750,000	0.37	0.11	<0.80	<0.50	0.72	<0.50	1.49	0.49	0.15	0.36	0.20	1.62	1.14	0.08	0.46	0.08	0.95	2.24	0.85	0.57	0.659
Methylene Chloride	3.5	35,000,000	ND	1.96	1.70	<0.50	<0.30	<0.50	0.56	2.80	0.07	0.25	0.06	0.41	0.47	<0.01	1.79	1.02	4.05	22.30	1.28	1.57	0.349
Vinyl Chloride	0.9	9,000,000	ND	ND	<0.80	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ND	<0.01	0.02	ND	ND	ND
Methane	1.25	12,500,000	ND	11.40	2.25	2.25	2.30	2.00	3.08	3.92	3.34	2.59	3.29	2.68	4.28	5.21	5.52	0.99	5,340.00	3,320.00	1,790.00	16,800.00	15,600.00

ND = Not Detected

Ambient Air Sample A1

Compound	25% LEL (%)	25% LEL (ppbv)	Sample Date																					
			11/92	2/93	5/93	8/93	11/93	3/94	6/94	9/94	11/94	3/95	6/95	9/95	12/95	3/96	5/96	9/96	6/97	9/97	5/98	9/99	4/01
		Units:	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv
Benzene	0.325	3,250,000	0.38	0.19	<0.08	<0.50	0.31	<0.50	<0.50	2.00	2.67	0.21	0.11	0.31	0.57	0.08	0.22	0.14	VOID	0.60	0.65	0.44	0.471
Toluene	0.3	3,000,000	1.59	0.14	<0.08	5.30	1.03	<0.50	15.27	8.50	10.03	2.28	0.30	2.52	3.50	0.016	0.67	0.15	VOID	6.01	0.94	3.78	3.02
Xylene (total)	0.275	2,750,000	0.63	0.12	<0.08	<0.50	0.58	<0.50	1.58	3.87	13.79	0.53	0.14	0.78	1.39	0.07	0.49	0.05	VOID	1.56	0.87	1.13	0.598
Methylene Chloride	3.5	35,000,000	ND	<0.02	<0.08	11.00	<0.30	1.92	15.91	0.51	0.79	3.37	0.34	1.97	1.13	<0.01	2.22	0.36	VOID	11.80	1.27	4.78	0.382
Vinyl Chloride	0.9	9,000,000	ND	ND	<0.08	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ND	VOID	ND	ND	ND	ND
Methane	1.25	12,500,000	ND	0.03	1.92	1.49	2.06	2.34	2.53	3.86	3.33	2.50	3.38	2.46	3.97	5.20	3.76	1.14	VOID	3,590.00	1,720.00	16,100.00	16,900.00

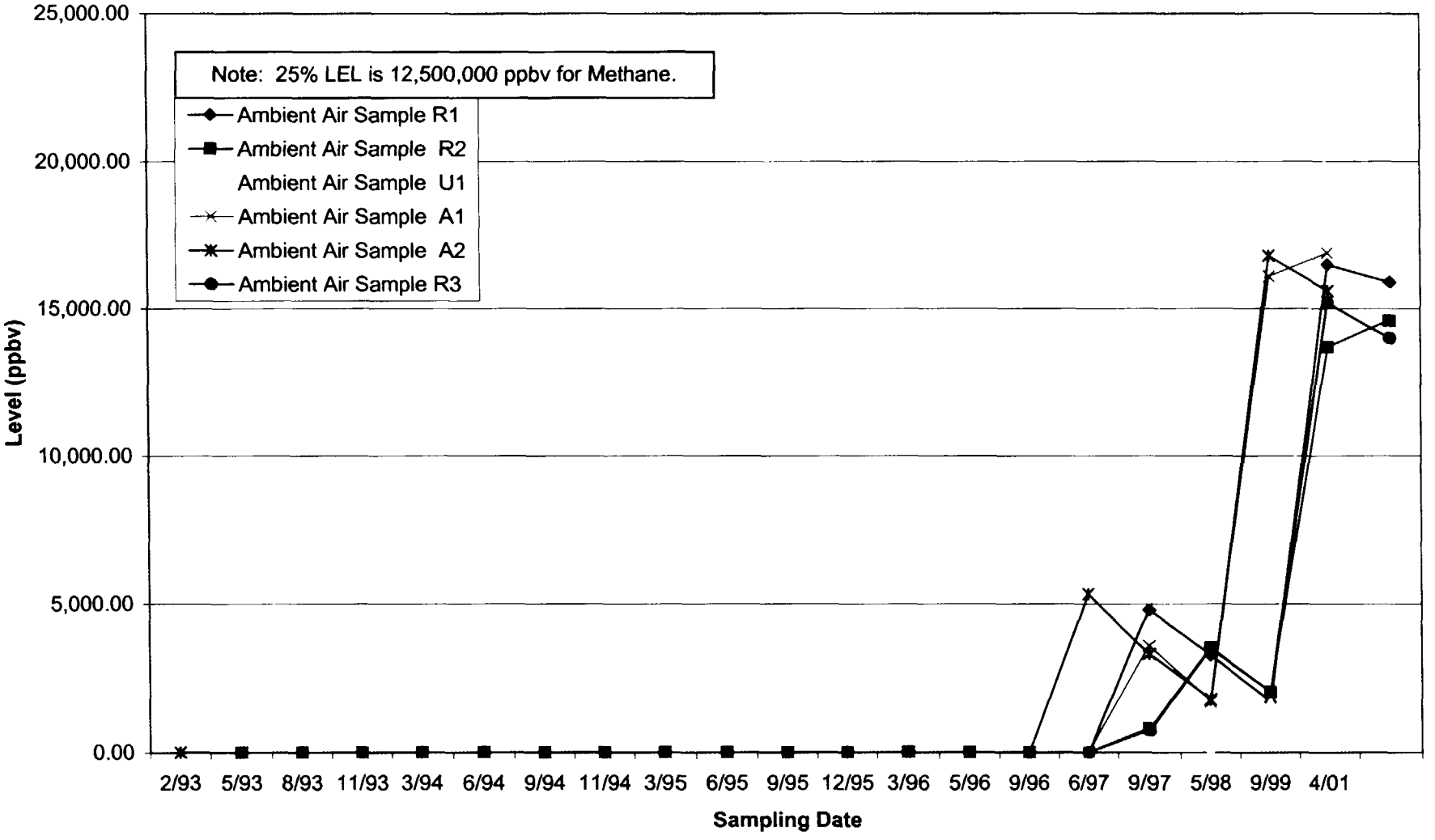
ND = Not Detected

Ambient Air Sample R3

Compound	25% LEL (%)	25% LEL (ppbv)	Sample Date																					
			11/92	2/93	5/93	8/93	11/93	3/94	6/94	9/94	11/94	3/95	6/95	9/95	12/95	3/96	5/96	9/96	6/97	9/97	5/98	9/99	4/01
		Units:	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv
Benzene	0.325	3,250,000		0.34	<0.70	0.58	0.36	<0.50	0.70	2.43	0.49	0.24	0.11	0.80	0.67	0.24	0.22	0.16	3.93	0.30	0.86	0.82	0.66
Toluene	0.3	3,000,000		0.80	<0.70	0.92	0.96	<0.50	3.45	8.63	0.92	1.35	0.35	4.75	3.59	0.66	0.63	0.15	11.80	2.63	0.98	3.33	2.95
Xylene (total)	0.275	2,750,000		0.38	<0.70	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

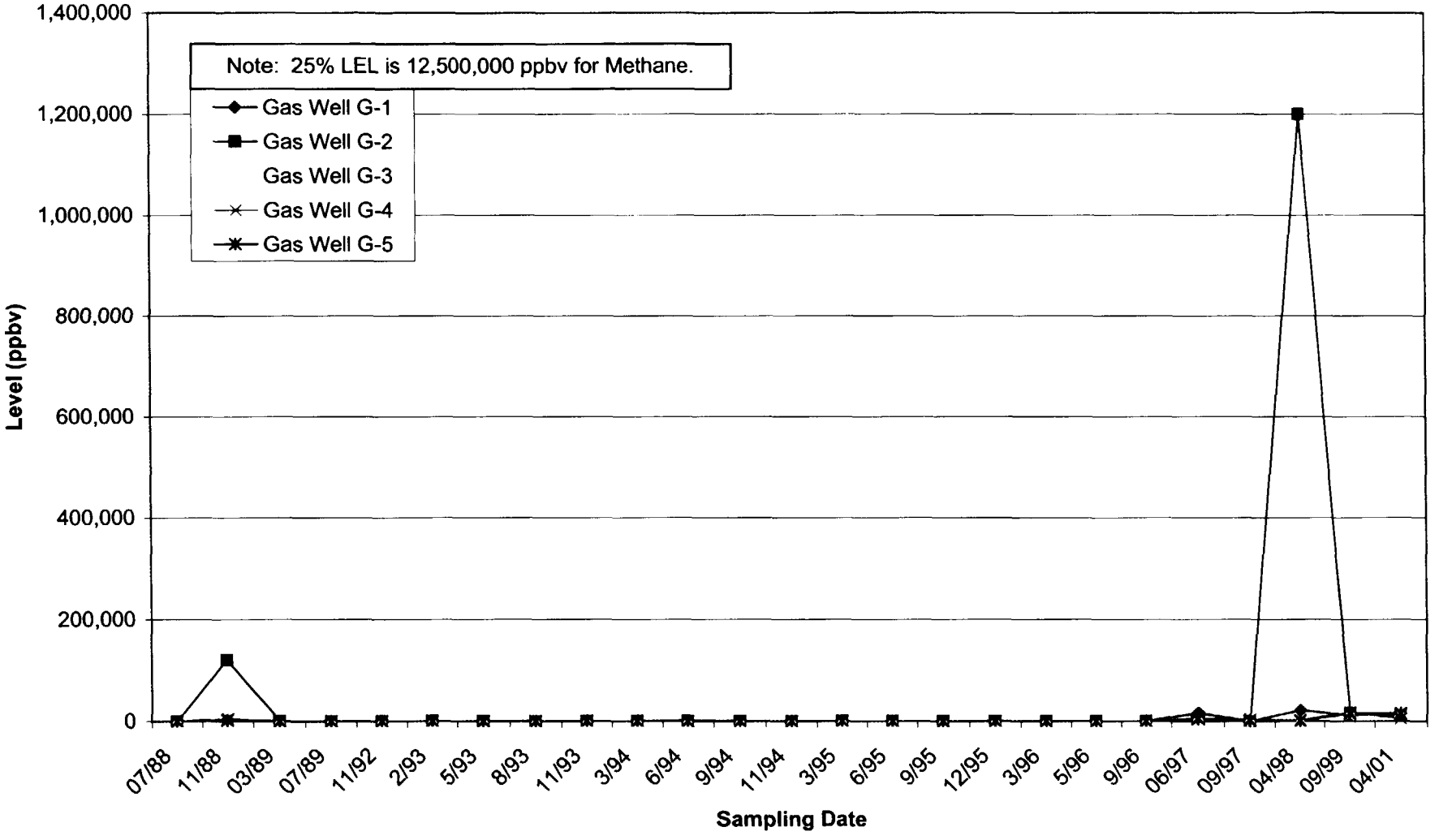
Form C-7

Methane Measurements



Form C-6

Methane Measurements



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SCS ENGINEERS

March 17, 2003
File No. 9000001.05

U.S. Army Corps of Engineers
CELRL-ED-E
P.O. Box 59
Louisville, Kentucky 40201

Attention: Mr. John Jent

Subject: Condition of Landfill Gas Migration Control System
Lees Lane Landfill, Louisville, Kentucky

Gentlemen:

Thank you for contacting SCS Engineers last Friday, March 14, 2003, to discuss landfill gas related conditions at the Lees Lane Landfill. As you know, a landfill gas (LFG) migration control system was installed at this facility in about 1980. The system consists of approximately 30 vertical extraction wells, installed in the floodwall right-of-way, between the Lees Lane Landfill and the Riverside Gardens Subdivision located adjacent. The gas control system is located in virgin ground outside the refuse limits. Its purpose is to intercept landfill gas that might otherwise be available for migration toward homes located in Riverside Gardens.

When the system was first installed in 1980, landfill gas was found to have migrated up to 1,000 ft outward from the landfill, and into and among the homes of Riverside Gardens. This condition was particularly enhanced under conditions of rising flood waters in the Ohio River, and a rising water table. Under these conditions, landfill gas was apparently "squeezed out" to a smaller, subsurface unsaturated zone. Landfill gas was then found to be migrating to greater distances. An explosion in one of the residential furnaces within Riverside Gardens in about 1977 precipitated an investigation.

Collected landfill gases are of low methane content, and are free vented at a blower/vent facility also located within the floodwall right-of-way. SCS Engineers was the design engineer of record on this original system. I was personally involved at that time with management of the overall project. To date, SCS had performed three separate projects under contract to the Jefferson County Department of Public Works (DPW) at this facility. These included:

1. Investigation of landfill gas migration. This project was performed by SCS Engineers for the Jefferson County DPW beginning in 1978 and ending in 1979. Monitoring probes were installed within the Corps of Engineers floodwall between Lees Lane Landfill and Riverside Gardens. Subsequently, additional monitoring probes were installed throughout Riverside Gardens to determine the extent of landfill gas migration. The first phase of well installations within the floodwall right-of-way were later

Form C-9
Correspondence with SCS Engineers

"permanentized" and made part of the ongoing gas monitoring network. Monitoring of the probes out in Riverside Gardens itself was discontinued.

2. SCS was subsequently contracted to the Jefferson County DPW to design and oversee the installation of an LFG migration control system. This project began in 1979, and was completed in late 1980. Actual construction and operational start-up of the migration control system occurred during the summer of 1980. As referenced above, the gas migration control system consisted of approximately 30 extraction wells. Gas was collected in these wells by a blower located inside a blower/vent building. Vacuum was applied to individual wells. Gases were then withdrawn through a subsurface header, and directed back to the blower/vent building.

   Immediately after start-up, the gas migration control system was found to be completely effective in mitigating the potential for laterally migrating gases. This was found to be the case both initially under normal conditions, and during subsequent flood stages of the Ohio River. In each case, the gas monitoring network described above was monitored, and readings were generally 0 percent methane, and always below the regulatory limit of 5 percent methane (a.k.a., the lower explosive limit or LEL).

3. SCS was then again contracted in 1985 and 1986. Our client was again the Jefferson County DPW. We were contracted to perform an investigation of the existing gas migration control system, to determine its effectiveness. At that point, the original system had been operational for about 5 years. SCS tested the condition of the entire migration control system, noted operating vacuums and gas compositions, and made recommendations on maintenance needed.

   As I recall, our finding at the time was that about 25 percent of the efficiency of the system was gone. Specifically, about one quarter of the wells had broken or silted in, and were no longer effective in controlling laterally-migrating gas. Operating vacuum and flows had considerably diminished, also by at least 25 percent.

   This degree of deterioration is typical for LFG migration control systems. Typically, the need for maintenance should be determined on at least an annual basis, and maintenance is likely required at 3-year cycles if the gas collection system is located within a settling and corrosive landfill environment. Alternatively, if the gas system is located in virgin ground (such as is the case here), maintenance at minimum 5-year cycles is likely required.

In our phone conversation the other day, you mentioned that the Metropolitan Sewer District (MSD) of Louisville has assumed ongoing monitoring of the gas monitoring probes, and apparently assumed that responsibility from the Jefferson County DPW at some juncture. Their monitoring has revealed that gas monitoring readings in those probes have been rising over time. A further deterioration of the gas migration control system is now suspected.

Apparently, the SCS investigation of 1985/1986 was the last observation on the operational effectiveness of the gas control system. If true, one could anticipate that significant deterioration (perhaps total failure) of the LFG collection system is likely at this point. If the system deteriorated 25 percent in the first five years, a much greater deterioration (perhaps to 100 percent) could be expected now. Of course, gas monitoring in the probes is reportedly still below LEL levels. If true, some effectiveness of the gas migration control system must be retained to this date.

In any event, we recommend that a thorough investigation of the operating efficiency of the LFG collection system be performed at the earliest date. The purpose of this program would be to observe operating conditions (well head vacuums, valve settings, physical conditions, and gas compositions). The total flow, vacuum/pressure and gas composition of the blower/vent should also be observed. Down-hole conditions at the extraction wells and any condensate traps should also be examined. The purpose here would be to determine whether wells and traps have physically failed, or silted in over time.

The outcome of this field investigation would be a report summarizing the condition of the system, and making recommendations for improvement. Those recommendations could call for total re-construction of the entire system, if substantial failure of the existing system has already occurred. In short, replacement of the system at that point may be a more productive economic application than attempting to rehabilitate the existing system.

The original work by SCS Engineers on this project was performed by James Walsh and other engineers at our Cincinnati, Ohio location. Most of those personnel remain with the firm. We would be quite interested in serving any client in an investigation of system conditions. We also stand available for maintenance, repair, and even replacement of the LFG system through our subsidiary organization, SCS Field Services. Field Services specializes in the maintenance, replacement, construction, and operation of LFG management systems.

Please contact the undersigned at any time for any further questions you may have, or if you wish to discuss specific work efforts. We appreciate your contacting SCS Engineers.

Sincerely,

James J. Walsh, P.E.
President
SCS ENGINEERS

JJW:rae

5-Year Review Questionnaire

Site Lee's Lane Landfill

City/State Louisville, KY

Date: 4/30/03 Phone No.

Name of Citizen

Address

Do you live near the Site? If yes, how long? 2 blocks from landfill — 32 yrs.

Are you familiar with EPA activities over the past years? Clean up activities — yes

What is your overall impression of the project? Did good job

Overall, have you been pleased or displeased with cleanup actions at this Site?

Pleased.

What effects, if any, have site operations had on the surrounding community? Not much

Do you still have any concerns regarding EPA clean up activities at the Site?

No.

Do you think you have been kept adequately informed about clean up activities at the Site?

I guess so.

Are you aware of any events, incidents, or activities at the site such as vandalism, trespassing, or emergency responses from local authorities? If so, please give details.

No

Is there someone else that you would like to recommend we contact for more information?

Do you have any suggestions that EPA can implement to improve c

Form C-8A
Telephone Interviews

Interview conducted by: Alice Bennett

Date conducted: 5/2/03

5-Year Review Questionnaire

Site Lee Lane Landfill
City/State Louisville, Ky

Date: 5/5/03 Phone No. _____

Name of Citizen _____

Address _____

How long have you lived near the Site? 1959

Are you familiar with EPA activities over the past years? Not really, never got involved

Do you still have any concerns regarding EPA clean up activities at the Site? Since not familiar with Site, can't come up w/ answer.

Overall, have you been pleased or displeased with EPA actions at this Site?

Do you think you have been adequately informed about clean up activities at the Site?

Is there any information about the Site that you would like to share with us that would assist in our 5-year review of site activities?

Is there someone else that you would like to recommend we contact for more information?

Do you have any suggestions that EPA can implement to improve communication with the public?

[A copy of the 5-year review will be placed in the Site Information Repository file located in the Site Information Repository at _____

Interview conducted by: Anne Barrett
Date conducted : _____

5-Year Review Questionnaire

Site: Lee's Lane Landfill

City/State: Louisville, Ky

Date: 3/27/03 Phone No. ______

Name of Citizen ______

Address ______

How long have you lived near the Site? N/A

Are you familiar with EPA activities over the past years? Only since 1996 when she became involved then Task Force

Do you still have any concerns regarding EPA clean up activities of the Site? Yes, property can't be used until cleaned up. Contamination in Ohio River with closed landfill? Politicians don't try to help the community, so people don't trust govt. & resists their help.

Overall, have you been pleased or displeased with EPA actions at this Site? Neither – Because neither the State or EPA has been responsive to the community, the people surrounding the site [illegible] do not trust the govt.

Do you think you have been adequately informed about clean up activities at the Site? yes – totally involved

Is there any information about the Site that you would like to share with us that would assist in our 5-year review of site activities? Many people played in landfill as children, many of them [illegible] almost/flooded. What can be done to help the people living around the landfill?

Site has been monitored since 1988 in conjunction [illegible] of Louisville - has their data.

Is there someone else that you would like to recommend we contact for more information? [illegible] the Buckhead family & [illegible] of Ky Natural Resources

Do you have any suggestions that EPA can implement to improve communication with the public? EPA needs to do something to get the community to trust what they are being told – they don't trust the govt. Request that a health study be done of people around this site. Ky 47582

[A copy of the 5-year review will be placed in the Site Information Repository file located in the Site Information Repository at ______

Riverside Gardens & Lake Dreamland - used as a dump - sludge in the water. Rubbertown industrial consists of the sites in group.

Interview conducted by: [signature]

Date conducted: ______

5-Year Review Questionnaire for Govt. Officials

Site Lee's Lane Landfill

City/State Louisville, Ky.

Date: 4/28/03 Phone No. ______

Name ______

Address ______

What is your overall impression of the project? He lived in area all his life & played on occasion dumped in landfill. For the most part he is pleased with work done there in 1990's. Drainage could have been better addressed. If activities done today, landfill would have been handled differently.

Have there been routine communications or activities conducted by your office regarding the Site? (Site visits, inspections, reporting activities, etc.) If so, please give purpose and results. There are routine inspections of landfill by MSD (maintenance) of area. Due to continued dumping of trash in areas of landfill, they [illegible] come in and clean up trash etc. & mowed grass area. Landfill has been monitored for 15 years.

Have there been any complaints, violations or other incidents related to the Site requiring a response by your office? If so, please give details of the events and results. Dumping continued in landfill, mostly by area residents. The landfill is used for 4-wheeling & BMX biking - trails all over landfill. The landfill is posted & officials arrest trespassers.

Do you feel well informed about the Site's activities and progress? Since direct involvement in 4/99, yes. He receives reports from industrial waste dept. on monitoring of groundwater and also of methane gas - odor control.

Do you think clean up activities at the Site have had a positive or negative impact on the community? In what ways? It depends upon whom you ask. The community around the landfill is evolving and progressing and improving itself.

Do you have any comments, suggestions, or recommendations regarding the Site's management or operation? Yes, there are areas in landfill that should be filled. The county has excavated dirt from various projects that could be brought in to level the landfill. It has been suggested that the landfill be turned into a recreational area in 5 years.

Interview conducted by Dixie Barrett

Date conducted May 5, 2003

C-80

Area [illegible] a number of companies & chemical & petroleum companies around landfill [illegible] noticeable, however, the landfill is closed

[illegible handwritten margin note] (Metro SD)

5-Year Review Questionnaire for Govt. Officials

Site: Lee's Lane Landfill

City/State: Louisville, Ky

Date: 4/28/03 Phone No ____________

Name ____________

Address ____________

What is your overall impression of the project? overall looks good - looks like area of gases (methane) levels creeping up - lack of control to access - doesn't appear to be a lot of surface problem. If more risk at site, would want more control to access.

Have there been routine communications or activities conducted by your office regarding the Site? (Site visits, inspections, reporting activities, etc.) If so, please give purpose and results.
Has they received quarterly report prepared by MSD. Once or twice / year their office people go on site.

Have there been any complaints, violations or other incidents related to the Site requiring a response by your office? If so, please give details of the events and results.
None that he knows of.

Do you feel well informed about the Site's activities and progress? Fairly well informed. [illegible] [illegible] now.

Do you think clean up activities at the Site have had a positive or negative impact on the community? In what ways?
Keeping houses from blowing up - in worse days real problem

Do you have any comments, suggestions, or recommendations regarding the Site's management or operation?
* wells that are suppose to extract methane - why were they designed as they were? might need to be updated. need regular pattern of vent wells - need to investigate - current [illegible] does not address source areas.

Interview conducted by [illegible]

Date conducted ____________

5-Year Review Questionnaire for Govt. Officials

Site: Lee's Lane Landfill

City/State: Louisville, Ky

Date: 4/28/03 Phone No. ______

Name ______

Address ______

What is your overall impression of the project? overall landfill is basically intact & stable, however, there are several areas that are in question. Rip-rap looks good along river. Goods have been dumped in landfill since clean up.

Have there been routine communications or activities conducted by your office regarding the Site? (Site visits, inspections, reporting activities, etc.) If so, please give purpose and results.
nothing routinely done over past 10 years. They did go out to site a week or two ago. Will be taking GSP of areas in landfill. Monitoring is being done by MSD of methane gas from landfill.

Have there been any complaints, violations or other incidents related to the Site requiring a response by your office? If so, please give details of the events and results.
Not recently - several years ago some residents complained about barrels being dumped in landfill. He found drain bubbling up through surface cap more in center of landfill toward S/D approx 3 years ago - drain still there some deterioration

Do you feel well informed about the Site's activities and progress? While involved

Do you think clean up activities at the Site have had a positive or negative impact on the community? In what ways? Some areas could have been done better but that was back in 1970's - if done today it would be a better cleanup action

Do you have any comments, suggestions, or recommendations regarding the Site's management or operation?
Sending me pictures via e-mail of land fill and how it looks

Interview conducted by Diane Barrett

Date conducted 4/28/03

* paths are apparent throughout landfill either made by wildlife or people - pieces of metal can be seen along paths.

Chemical plants in the immediate area, would be difficult to attribute odors as being from only the landfill.

5-Year Review Questionnaire

Site Lee's Lane Landfill
City/State Louisville, Ky.

Date: 3/25/03 Phone No. _____

Name of Citizen _____

Address _____

How long have you lived near the Site? N/A

Are you familiar with EPA activities over the past years? Yes, Frequently

Do you still have any concerns regarding EPA clean up activities of the Site?
Not real strong current concerns public concerns

Overall, have you been pleased or displeased with EPA actions at this Site?
Pleased

Do you think you have been adequately informed about clean up activities at the Site?
Yes, OK

Is there any information about the Site that you would like to share with us that would assist in our 5-year review of site activities?
Health Dept. no longer monitors the Site.

Is there someone else that you would like to recommend we contact for more information?
Annette Bolam w/ West County Task Force (502) 852-4667

Do you have any suggestions that EPA can implement to improve communication with the public? _____

[A copy of the 5-year review will be placed in the Site Information Repository file located in the Site Information Repository at _____

Interview conducted by: Diane Barrett
Date conducted: 3/25/03

5-Year Review Questionnaire

Site: Lee's Lane Landfill

City/State: Louisville, Ky.

Date: 5/5/03 Phone No.

Name of Citizen

Address

Do you live near the Site? If yes, how long? Couple of blocks over - in 1972

Are you familiar with EPA activities over the past years? Familiar with some

What is your overall impression of the project? At time, thought it was an inadequate job — they were to go tiling in area & they would see the installation surface (-side). I think things could have been done better.

Overall, have you been pleased or displeased with cleanup actions at this Site? Overall displeased — leak [illegible] system clogged & not working. Think landfill should have been dug up and removed to fully "clean up" the area.

What effects, if any, have site operations had on the surrounding community? Think there has been very little change in community. People were upset in the beginning at one time the landfill. Has been forgotten. People still use landfill as dumping area & ride ATV's & BMX bikes on the landfill.

Do you still have any concerns regarding EPA clean up activities of the Site? Don't know - don't have enough information to give a response.

Do you think you have been kept adequately informed about clean up activities at the Site? Fairly well

Are you aware of any events, incidents, or activities at the site such as vandalism, trespassing, or emergency responses from local authorities? If so, please give details. Currently a multi-purpose trail/walk is being established along river & path is filled with glass & mud from surrounding residents. Negative impact on wildlife in area (because of ATV's & BMX bikes).

Is there someone else that you would like to recommend we contact for more information? Can't think of anyone.

Do you have any suggestions that EPA can implement to improve communication with the public? Direct mail & media & now internet.

Interview conducted by: Diane Barrett

Date conducted: 5/5/2003

Environmental Consultants

2060 Reading Road
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Cincinnati, Ohio 45202-1497

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info@ci.scsengineers.com

SCS ENGINEERS

March 17, 2003
File No. 9000001.05

U.S. Army Corps of Engineers
CELRL-ED-E
P.O. Box 59
Louisville, Kentucky 40201

Attention: Mr. John Jent

Subject: Condition of Landfill Gas Migration Control System
Lees Lane Landfill, Louisville, Kentucky

Gentlemen:

Thank you for contacting SCS Engineers last Friday, March 14, 2003, to discuss landfill gas related conditions at the Lees Lane Landfill. As you know, a landfill gas (LFG) migration control system was installed at this facility in about 1980. The system consists of approximately 30 vertical extraction wells, installed in the floodwall right-of-way, between the Lees Lane Landfill and the Riverside Gardens Subdivision located adjacent. The gas control system is located in virgin ground outside the refuse limits. Its purpose is to intercept landfill gas that might otherwise be available for migration toward homes located in Riverside Gardens.

When the system was first installed in 1980, landfill gas was found to have migrated up to 1,000 ft outward from the landfill, and into and among the homes of Riverside Gardens. This condition was particularly enhanced under conditions of rising flood waters in the Ohio River, and a rising water table. Under these conditions, landfill gas was apparently "squeezed out" to a smaller, subsurface unsaturated zone. Landfill gas was then found to be migrating to greater distances. An explosion in one of the residential furnaces within Riverside Gardens in about 1977 precipitated an investigation.

Collected landfill gases are of low methane content, and are free vented at a blower/vent facility also located within the floodwall right-of-way. SCS Engineers was the design engineer of record on this original system. I was personally involved at that time with management of the overall project. To date, SCS had performed three separate projects under contract to the Jefferson County Department of Public Works (DPW) at this facility. These included:

1. Investigation of landfill gas migration. This project was performed by SCS Engineers for the Jefferson County DPW beginning in 1978 and ending in 1979. Monitoring probes were installed within the Corps of Engineers floodwall between Lees Lane Landfill and Riverside Gardens. Subsequently, additional monitoring probes were installed throughout Riverside Gardens to determine the extent of landfill gas migration. The first phase of well installations within the floodwall right-of-way were later

Form C-9
Correspondence with SCS Engineers

"permanentized" and made part of the ongoing gas monitoring network. Monitoring of the probes out in Riverside Gardens itself was discontinued.

2. SCS was subsequently contracted to the Jefferson County DPW to design and oversee the installation of an LFG migration control system. This project began in 1979, and was completed in late 1980. Actual construction and operational start-up of the migration control system occurred during the summer of 1980. As referenced above, the gas migration control system consisted of approximately 30 extraction wells. Gas was collected in these wells by a blower located inside a blower/vent building. Vacuum was applied to individual wells. Gases were then withdrawn through a subsurface header, and directed back to the blower/vent building.

   Immediately after start-up, the gas migration control system was found to be completely effective in mitigating the potential for laterally migrating gases. This was found to be the case both initially under normal conditions, and during subsequent flood stages of the Ohio River. In each case, the gas monitoring network described above was monitored, and readings were generally 0 percent methane, and always below the regulatory limit of 5 percent methane (a.k.a., the lower explosive limit or LEL).

3. SCS was then again contracted in 1985 and 1986. Our client was again the Jefferson County DPW. We were contracted to perform an investigation of the existing gas migration control system, to determine its effectiveness. At that point, the original system had been operational for about 5 years. SCS tested the condition of the entire migration control system, noted operating vacuums and gas compositions, and made recommendations on maintenance needed.

   As I recall, our finding at the time was that about 25 percent of the efficiency of the system was gone. Specifically, about one quarter of the wells had broken or silted in, and were no longer effective in controlling laterally-migrating gas. Operating vacuum and flows had considerably diminished, also by at least 25 percent.

   This degree of deterioration is typical for LFG migration control systems. Typically, the need for maintenance should be determined on at least an annual basis, and maintenance is likely required at 3-year cycles if the gas collection system is located within a settling and corrosive landfill environment. Alternatively, if the gas system is located in virgin ground (such as is the case here), maintenance at minimum 5-year cycles is likely required.

In our phone conversation the other day, you mentioned that the Metropolitan Sewer District (MSD) of Louisville has assumed ongoing monitoring of the gas monitoring probes, and apparently assumed that responsibility from the Jefferson County DPW at some juncture. Their monitoring has revealed that gas monitoring readings in those probes have been rising over time. A further deterioration of the gas migration control system is now suspected.

Apparently, the SCS investigation of 1985/1986 was the last observation on the operational effectiveness of the gas control system. If true, one could anticipate that significant deterioration (perhaps total failure) of the LFG collection system is likely at this point. If the system deteriorated 25 percent in the first five years, a much greater deterioration (perhaps to 100 percent) could be expected now. Of course, gas monitoring in the probes is reportedly still below LEL levels. If true, some effectiveness of the gas migration control system must be retained to this date.

In any event, we recommend that a thorough investigation of the operating efficiency of the LFG collection system be performed at the earliest date. The purpose of this program would be to observe operating conditions (well head vacuums, valve settings, physical conditions, and gas compositions). The total flow, vacuum/pressure and gas composition of the blower/vent should also be observed. Down-hole conditions at the extraction wells and any condensate traps should also be examined. The purpose here would be to determine whether wells and traps have physically failed, or silted in over time.

The outcome of this field investigation would be a report summarizing the condition of the system, and making recommendations for improvement. Those recommendations could call for total re-construction of the entire system, if substantial failure of the existing system has already occurred. In short, replacement of the system at that point may be a more productive economic application than attempting to rehabilitate the existing system.

The original work by SCS Engineers on this project was performed by James Walsh and other engineers at our Cincinnati, Ohio location. Most of those personnel remain with the firm. We would be quite interested in serving any client in an investigation of system conditions. We also stand available for maintenance, repair, and even replacement of the LFG system through our subsidiary organization, SCS Field Services. Field Services specializes in the maintenance, replacement, construction, and operation of LFG management systems.

Please contact the undersigned at any time for any further questions you may have, or if you wish to discuss specific work efforts. We appreciate your contacting SCS Engineers.

Sincerely,

James J. Walsh, P.E.
President
SCS ENGINEERS

JJW:rae